PURPOSE OF THE MANUAL

The purpose of this manual is to provide you with the information to install, use and understand FDRPAS (FDR Plug and Swap).

WHAT IS FDRPAS?

FDRPAS is used to perform a non-disruptive move of a DASD volume from one physical device to another. It allows an installation to install new disk hardware, and move existing DASD volumes to the new hardware from older hardware, without disrupting normal operations or requiring a re-IPL. It can also be used to move volumes within an existing configuration for load balancing purposes, and to create point-in-time copies of volumes for non-disruptive backups.

FDRPAS™ is a proprietary program product of
INNOVATION DATA PROCESSING
Innovation Plaza
275 Paterson Avenue
Little Falls, New Jersey 07424-1658
and is available for license exclusively from INNOVATION DATA PROCESSING, INC.

EUROPEAN OFFICES:

France

Innovation Data Processing S.A.R.L.
191 Avenue Aristide Briand
94230 CACHAN
Tel: 01-49-69-94-02 Fax: 01-49-69-90-98
E-mail: frsupport@fdrinnovation.com
frsales@fdrinnovation.com

Netherlands

Innovation Data Processing
Brouwerstraat 8
1315 BP Almere
Tel: 036-534 1660 Fax: 036-533 7308
E-mail: nlsupport@fdrinnovation.com
nlsales@fdrinnovation.com

Germany

Innovation Data Processing
International Ltd.
Orleansstrasse 4a
D-81669 München
Tel: 089-489 0210 Fax: 089-489 1355
E-mail: desupport@fdrinnovation.com
desales@fdrinnovation.com

United Kingdom

Innovation Data Processing Ltd.
Clarendon House
125 Shenley Road
Borehamwood, Herts, WD6 1AG
Tel: 0208-905 1266 Fax: 0208-905 1428
E-mail: uksupport@fdrinnovation.com
uksales@fdrinnovation.com

A copy of this manual is provided on CD-ROM in IBM Bookmanager format for online use, and in Adobe PDF format for local printing.

US CONTACTS

Voice: 973-890-7300 Fax: 973-890-7147
Home page: www.innovationdp.fdr.com
E-mail: Sales: sales@fdrinnovation.com
Technical Support: support@fdrinnovation.com

FTP ACCESS FOR FDRPAS CUSTOMERS

For the latest information, considerations, and fixes for FDRPAS, go to the Innovation web site at

www.innovationdp.fdr.com

and click on "FDRPAS Customers" for access to a special FDRPAS FTP site.

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SWAP SIMULATION

A swap can now be simulated, using the SIMSWAP command. SIMSWAP can be used to:

- validate the parameters on the SWAP statement
- validate the VOL= and SWAPUNIT= parameters on the MOUNT statement
- display the systems which have access to the source device (for disk subsystems where FDRPAS can determine the systems)

SYSTEM COUPLE DATA SETS

Volumes containing Couple Data Sets (CDS), used with the coupling facility in a parallel sysplex, can now be swapped. See section 320.02 for considerations when swapping such volumes.

Summary of Modifications for FDRPAS V5.4 Level 15

CONCURRENT SWAPS IN A SINGLE SWAP TASK

A single FDRPAS swap task (a batch job specifying SWAP or SWAPDUMP TYPE=FULL) can now process up to 32 volumes concurrently. This makes it practical to swap a large number of volumes concurrently, since a separate swap task is no longer required for each volume. This is particularly useful for SWAPDUMP, where you may want to create point-in-time backups of a large number of disks, all synchronized at a single time.

To use this feature, specify MAXTASKS=nn (up to 32) on the SWAP statement and provide multiple MOUNT statements for the volumes to be swapped. It can also be used for swaps started from the FDRPAS ISPF panels (see the Options panel).

LARGE DISKS

FDRPAS supports "large disks", up to 32760 cylinders in size, if the appropriate IBM maintenance to support them is installed. You can swap to and from such large disks. If the LARGERSIZE=OK operand is specified, you can swap from a smaller disk (such as a 3390-3 or a 3390-9) to a large disk. Volumes larger than 10017 cylinders (the size of a 3390-9) will be identified as "3390-32" in FDR messages.

WARNING: if a volume is swapped to a large disk but the IBM maintenance to support large disks is not installed on all sharing systems, the results are unpredictable.

DYNAMIC I/O PACING

FDRPAS now has an option , PACING=DYNAMIC, to dynamically modify its I/O pacing in response to I/O activity and I/O queuing on the source device. I/O pacing inserts delays between WRITEs to the target device, which also delays READs on the source device. Dynamic I/O pacing will vary that delay based on the apparent impact of the FDRPAS I/Os on other activity on the source volume. Static I/O pacing (the PACEDELAY= option, which can be changed interactively from the ISPF panels) is still available.

E-MAIL NOTIFICATION

You have the option of sending e-mail messages when a FDRPAS operation is unsuccessful (and if you like, for successful operations as well). An optional FDREMAIL DD statement in a FDRPAS step will invoke the facility; it points to control statements defining the message and its recipients. A mail server that supports SMTP (Simple Mail Transport Protocol) is required. Messages can also be sent to alpha-numeric pagers and cell phones. Details are in Section 320.04.

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ISPF PANEL ENHANCEMENTS

The FDRPAS ISPF panels have been significantly enhanced:

- for each volume, they can now display the SMS storage group of the volume, its device type and size in cylinders, and the SSID (subsystem ID) and serial number of the control unit.
- You can select volumes for display by volser, unit address, storage group, SSID or control unit serial. Wild card characters can be used during selection.
- The display can be sorted by all of the above attributes and others.
- There are now alternate display formats which display only 1 or 2 lines per volumes, allowing more volumes to be displayed at once.
- The display will indicate if a swap is waiting for an operator reply (for messages FDRW01 or FDRW68) and will allow you to reply from the panel. This reduces operator involvement and enhances remote operation of FDRPAS.

SECURITY ENHANCEMENTS

FDRPAS will now issue RACROUTE calls to check for FACILITY class authority for FDRPAS operations. The user must have at least READ authority to resource names:

FDRPAS.SWAP	for SWAP operations
FDRPAS.SWAPDUMP	for SWAPDUMP operations
FDRPAS.SWAPBUILDIX	for SWAPBUILDIX operations

in security class FACILITY. Check the documentation for your security system for details on defining FACILITY class protection. If the resources are not protected, the operation will continue.

TARGET VOLUME VERIFICATION

FDRPAS has a new option to check the target volume in a SWAP or SWAPDUMP operation to insure that it is empty. If the option is selected, and the volume contains any datasets other than a VTOC, VTOC index and VVDS, the swap will fail.

SWAP TO SMALLER DISK

FDRPAS has the ability to swap a volume to a target disk with a smaller capacity (fewer cylinders), such as from a 3390-3 to a 3390-2. However, FDRPAS cannot relocate data sets, so no data sets can exist on cylinders that are beyond the size of the target, and you must insure that no new data sets get allocated in the upper cylinders during the swap. A special operand is required to enable a swap to a smaller disk, so if you have a need to do so, contact Innovation for details and advice.

ERROR RECOVERY FOR CHANNEL EXTENDERS

FDRPAS has an option designed for use with target disks attached over a channel extender (remote link). If SWAPIOERR=RETRY is specified, and a WRITE error occurs on the target disk, FDRPAS will enter a retry mode where it will retry the failing I/O every 5 seconds until it is either successful or the swap is manually terminated. If the remote link fails, FDRPAS will wait for it to be repaired and will automatically continue.

Summary of Modifications for FDRPAS V5.4 Level 10

PARALLEL ACCESS VOLUME(PAV) SUPPORT

Parallel Access Volumes are now supported by FDRPAS. It supports PAVs on the IBM 2105 ESS (Shark) and also on EMC Symmetrix systems in 2105 emulation.

PAVs will be disabled during the swap process. If you are swapping from one device with PAVs to another device with PAVs, they will be re-enabled after the swap. However, if you are swapping from a non-PAV device to a PAV device, or vice versa, an IBM limitation forces PAVs to remain disabled on the PAV device until the next IPL.

EMC CONSISTENCY GROUP SUPPORT

FDRPAS now supports EMC Consistency Groups. However, to complete the support you may need install a fix from EMC. FDRPAS will allow a volume in a consistency group to be swapped only to another volume in the same consistency group. Details are in Section 320.01.

CONCURRENT COPY SUPPORT

If FDRPAS detects that a concurrent copy session is active and doing I/O on a source volume, it will delay completing the swap until no concurrent copy I/O has been detected for 2 minutes. Details are in Section 320.02.

CONTINUED . . .

Summary of Modifications for FDRPAS V5.4 Level 10 (continued)

JES3 SUPPORT FDRPAS can now be executed under JES3. However, it can only swap volumes on devices which are not managed by JES3. A JES3-managed disk is one for which there is a DEVICE statement in the JES3 initialization statements. If there is no DEVICE statement for a given disk device, it will not be JES3-managed and it can be the source or target device in a FDRPAS swap.

INDEXED VTOC REBUILD FDRPAS includes a utility function which allows you to build an indexed VTOC (VTOCIX) or rebuild a disabled VTOCIX on a shared DASD volume while it is online to multiple systems. This is equivalent to the BUILDIX function of the IBM ICKDSF utility, except that ICKDSF requires that you vary the volume offline to every system except one before you execute BUILDIX. The SWAPBUILDIX function of FDRPAS uses FDRPAS communication and co-ordination techniques to allow the VTOCIX to be built while online to all sharing systems.

DDSR ON RVA/ SVA/V960 Earlier versions of the FDRPAS manual documented a potential problem with DDSR (Deleted Space Release) on IBM RVA and StorageTek SVA/V960 disk subsystems during swaps. We have discovered that this is incorrect; there is no problem with either dynamic or interval DDSR. There is the possibility of a diagnostic message when running a "space utilization" report on those systems. Details are in Section 320.02.

SUSPEND/ RESUME Through the FDRPAS ISPF panels, it is now possible to suspend an active swap, and resume it later. When suspended, FDRPAS will not copy any tracks from the source volume to the target device, but it will continue to monitor updates on the source volume. When resumed, copying of original and updated tracks begins again.

SYSTEM RESIDENCE VOLUMES FDRPAS will now identify swapped volumes which contain IPL text on the label track or an IODF data set in the VTOC and issue message FDR252 on the console to warn that system IPL parameter changes may be required before the next IPL.

HISTORY PERFORMANCE The performance of FDRPAS history reports (in batch or via the FDRPAS ISPF panels) has been significantly improved.

Summary of Modifications for FDRPAS V5.4 Level 01

Version 5.4 level 01 is the initial production release of FDRPAS.

64-BIT ADDRESSING SUPPORT When running on a IBM z/900 (2064) under z/OS or OS/390 2.10 in 64-bit mode, FDRPAS will exploit 64-bit real storage for I/O buffers and other control blocks.

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300.01 FDRPAS OVERVIEW

FDRPAS (FDR Plug and Swap) is used to move OS/390 and z/OS disk volumes non-disruptively from one disk drive to another, and to create non-disruptive point-in-time backups of disk volumes.

FDRPAS allows an OS/390 or z/OS installation to:

- swap disk volumes from their current locations to new disk hardware
- move disk volumes within the installation for load balancing
- create point-in-time backups of disk volumes
- create duplex copies of disk volumes
- do this volume movement without interrupting any system activity
- do this volume movement during normal system operations
- swap shared DASD on all sharing systems simultaneously
- swap many disk volumes concurrently
- monitor and control FDRPAS functions with ISPF panels

FDRPAS BENEFITS

- **The operating system, application jobs, online systems, and users will be unaware that FDRPAS is swapping disk volumes to new disk devices.**
- **A 24x7 installation, with no window for major re-configurations and hardware changes, can install and activate new disk hardware.**
- **Even installations which do have dedicated maintenance windows may choose to use FDRPAS to swap to new disk hardware during normal business hours.**
- **No matter how big your maintenance window is, it isn't big enough to move the terabytes of data in most installations. FDRPAS removes that limitation.**
- **FDRPAS can be used for load balancing within your existing disk hardware.**
- **FDRPAS can create point-in-time backups without special hardware features.**
- **It can create duplex copies of volumes, between control units from different vendors, without special hardware connections. These copies can be in local or remote subsystems.**

SUPPORTED DISK HARDWARE

FDRPAS supports a wide variety of disk devices from hardware vendors including *IBM, EMC, StorageTek, Amdahl* and *Hitachi*. It can swap disk volumes between disks of the same type from the same hardware vendor or different hardware vendors without any special software or hardware modifications.

FDRPAS supports disks attached via FICON, ESCON, and parallel (bus/tag) channels. FICON and ESCON directors are supported.

SUPPORTED VOLUME TYPES

FDRPAS can swap any OS/390 or z/OS volume including the SYSRES volume, other system volumes, open catalog volumes, application data volumes, CICS volumes, database volumes, TSO volumes, SMS-managed volumes and work volumes. The only exceptions are volumes containing active local page or swap data sets and JES3-managed volumes.

300.01 CONTINUED . . .

MOVEMENT TO NEW HARDWARE

OS/390 and z/OS hardware and software allows you to attach new disk subsystems (hardware) to your system and dynamically activate an updated I/O configuration to make them available. FDRPAS complements that capability by allowing you to move your disk volumes to this new hardware *while those volumes are still in use.*

When the FDRPAS swap of a volume is complete, the volume resides completely on the new device, and the original device is no longer required. If all the volumes on an old disk subsystem are moved to new locations with FDRPAS, the old subsystem can be powered off and disconnected.

Without the use of FDRPAS, implementation of new disk subsystems might require that many of your applications, perhaps your entire system, be shut down while volumes are backed up and restored to new locations. The conversion process may take many hours, even days, and often needs to be done during evenings or weekends.

FDRPAS can be used to move production application volumes to new hardware, to see if the hardware meets performance expectations or claims. If it doesn't, FDRPAS can easily move the data back to its original location.

With FDRPAS, the new hardware can be implemented at any time, even during prime time, without interrupting any of your normal workload or activities. FDR Plug and Swap truly allows you to "plug" in new disk hardware and "swap" your disk data to the new disks non-disruptively.

I/O LOAD BALANCING

FDRPAS can also be used to move disk volumes for load balancing purposes *while those volumes are still in use.*

System performance monitoring may discover that certain channel paths, disk subsystems, or sets of disk hardware are overloaded because of the current placement of certain data sets or databases. These overloads may cause your service times to degrade, and the problem can get worse over time.

The normal response to such overloads is to live with the problem until time can be scheduled to shut down the affected applications and move volumes or data sets until the I/O loads are more evenly balanced.

With FDRPAS, volumes can be moved within your system to rebalance your I/O loads at any time, while the applications are running. I/O load balancing can become a regular part of your system performance tuning.

POINT-IN-TIME BACKUPS

FDRPAS can also be used to create non-disruptive point-in-time backups of disk volumes, when used in conjunction with FDRINSTANT, a feature of the FDR family of disk management software products.

In this mode, FDRPAS copies an online disk volume to an offline target, and then optionally continues running to keep the offline copy in synchronization with the online disk. At the point when you want to take the backup of the online disk, you terminate FDRPAS and the offline disk contains an exact point-in-time copy of the online data. FDRINSTANT allows you to back up that offline copy as if you were backing up the online disk, except that the data is frozen at that point-in-time.

FDRINSTANT works with various hardware functions which allow for the creation of point-in-time copies, such as Snapshot, FlashCopy, TimeFinder and ShadowImage. FDRPAS can be used with FDRINSTANT when none of those hardware functions are available; it supports FDR and FDRDSF backups and FDRCOPY, but not FDRABR at this time.

300.01 CONTINUED . . .

DUPLEX COPIES

FDRPAS can also be used to create duplex copies of volumes, without requiring special hardware connections. These duplex copies can be in subsystems which are locally attached, or remotely attached over extended-distance connections or channel extenders. There are no hardware restrictions: the duplex copy of a volume can be in any disk subsystem, even if it is from a different vendor than the primary copy.

These duplex copies are updated asynchronously. FDRPAS will copy each volume and will then monitor the primary volume for updates, re-copying updated tracks as necessary to keep the volumes closely synchronized.

At any point, the duplex volume can be split from the primary and can be used as a copy of the primary volume.

INDEXED VTOC MAINTENANCE UTILITY

As a convenience for FDRPAS customers, FDRPAS includes a utility function to create an Indexed VTOC (VTOCIX) or rebuild a disabled VTOCIX on a volume even while that volume is online and in use on multiple systems. This is equivalent to the BUILDIX function of the IBM ICKDSF utility, except that BUILDIX requires that you place the volume offline to all sharing systems except one, which is disruptive to the normal use of the volume and usually requires a scheduled outage to use it. The FDRPAS SWAPBUILDIX function uses the cross-system coordination functions built into FDRPAS to allow the BUILDIX to be recognized on all systems without taking it offline.

300.02 FDRPAS OPERATION

FDRPAS can swap volumes in use on a single system image, as well as those attached to multiple systems or LPARs in a shared-DASD complex or sysplex, whether locally or remotely attached. Multiple volumes can be swapped concurrently.

FDRPAS TASKS

FDRPAS operates as two kinds of tasks:

1 the active swap task. This task will initiate the swap of one or more disk volumes to new disk devices. It will copy the data tracks from the source volume to the target disk, and will cause the operating system to swap all I/O to the target when the disks are synchronized. A single swap task can swap up to 32 disk volumes concurrently. If you need to swap more than 32 volumes concurrently, you must start multiple swap tasks.

2 the update monitor task. This task will monitor one or more offline potential target disk devices. It will detect that a swap has begun on a disk volume and will install I/O intercepts which will monitor all I/O to the source volume for updates. It also causes the operating system to swap all I/O to the target when the disks are synchronized. You can use one monitor task (per system image) to monitor all potential target devices, or you may choose to start multiple monitor tasks on each system image, each monitoring a set or range of targets. You can even start one monitor per target, if you prefer. If a monitor task is monitoring multiple target devices, it will actually start additional monitors (one per target device) as internal subtasks or external started tasks when a swap request is detected.

When multiple CPUs or LPARs (system images) have access to a volume to be moved, the swap task for each volume will execute on only one system image, but the monitor task must execute on **all** system images with access to the volume (up to 128 system images are supported). The swap task will also act as the monitor task on the system on which it is executing.

These tasks can be executed as submitted batch jobs, or as started tasks executed on-demand, although we will refer to them as "tasks" in this manual.

FDRPAS VOLUME SWAP

Swap of a disk volume is very simple. An FDRPAS monitor task is started on each system that has access to the target device, monitoring that device. On one system, an FDRPAS swap task is started to initiate the swap of the online source volume to the offline target disk device. It is recommended that you execute the swap task on the system with the most update activity on the volume; however, if you are executing many swaps concurrently, you should spread the swap tasks across as many systems as possible.

The FDRPAS swap task will communicate with the monitor tasks on all other systems, to coordinate the swap operation. It will verify that every system which can see both the source and target volumes is involved in the swap. FDRPAS starts the swap only if the target device is offline to all sharing systems, to insure that an active volume cannot be accidentally overlaid.

The FDRPAS swap task will copy all allocated tracks (for some data sets, only used tracks) on the source volume to the target disk, while simultaneously detecting all updates to the source volume; updated tracks will be re-copied if necessary so that the target disk will eventually contain an exact image of all of the active data on the source volume. The target disk will remain offline to OS/390 during the copy, so that the copied data is protected until the swap is complete.

Once the copy is complete and the two devices are completely synchronized, FDRPAS will complete the swap by asking OS/390 to re-direct all I/O for the volume from the original source device to the new target device on every system involved. The new device effectively replaces the original, and the original disk is placed offline. All existing jobs, tasks and users who were allocated to the volume are now re-allocated to the target device, although they will be unaware that the swap has taken place.

When the swap is complete, the volume label on the old source device will be modified so that OS/390 will no longer be able to vary it online. When the system is next re-IPLed, it will find the volume on the target device and will not attempt to use the old source device. To be sure that this occurs, do **not** mark the target devices offline in your I/O configuration.

300.02 CONTINUED . . .

FDRPAS VOLUME SWAP (Continued)

Once all volumes in a disk subsystem have been swapped to new devices, you can power off and disconnect the old subsystem, if that is your intention. If you want to reuse the old device for some purpose, you can do an offline INIT with the IBM ICKDSF utility to give it a new volume serial, or you can execute the FDRPASV1 utility (see Section 320.02), which can modify the volume label on the original device so that it can be re-mounted with its original volume serial, if you need to do this.

Only the source and target devices are accessed by FDRPAS during the swap. It does **not** use any additional communication between systems. It **does not require** TCP/IP, VTAM, a dataset on a third disk volume or a coupling facility.

The swap is accomplished with minimal impact on the performance of applications using the volumes being swapped. Applications continue to execute, unaware that the data movement is occurring or has completed. FDRPAS manages the copy to minimize its effect on the system. For example, inactive data sets are copied first, and tracks within active data sets which are updated are deferred until the end of the copy, so that they do not have to be copied many times. If the FDRPAS copy I/O is noticeably impacting system performance, you can request that the FDRPAS I/O be paced, adding a small delay between each I/O to allow other applications access to the disks and channels; I/O pacing can be dynamically modified during the swap process.

Swapping of a volume can be terminated at any time before the final swap without affecting the original device or any applications using it. FDRPAS ISPF panels can be used to terminate the swap. Alternately, you can cancel a swap task and all of the active swaps in that task will terminate with an error.

OS/390 swap services are invoked to perform the final swap. As a result of this swap service, the UCB (Unit Control Block) of the source and target disks are swapped in memory, so that the original source UCB now points to the new device, and vice versa. This allows the UCB pointers of all jobs, tasks, and users who have the source device allocated to remain unchanged and unaware that a new device is in use. Note that if your installation has JCL or dynamic allocation which allocates using the actual unit address (e.g., UNIT=3FA), they will need to be changed after the swap.

After a successful swap, the now-offline original device can be used as a point-in-time backup of the volume, at the point of the final swap. If you are using FDRPAS to migrate to new hardware, when all volumes in the old disk subsystem have been swapped to new disks, the old subsystem can be disconnected and removed.

SWAP PHASES

The operation of FDRPAS is divided into 5 phases:

PHASE 1, INITIALIZATION: this phase begins when a swap is requested by an FDRPAS swap task. The swap request is validated and, if multiple systems are involved, the FDRPAS monitor tasks on the other systems are notified of the swap request.

- If CONFMESS=YES was specified, FDRPAS will ask the system operator for permission to continue, via a WTOR with message FDRW01. You can also reply to this message from the FDRPAS ISPF panels.
- FDRPAS will verify that the specified source volume and target device are valid for a swap, making sure that they are the same disk device type, that the target is offline to all systems, and that the source is eligible to be swapped. It also checks if the devices have the same number of data cylinders unless LARGERSIZE=OK is specified, in which case the target can be larger. If FDRPAS security is enabled, FDRPAS will verify that the security userid associated with the swap task has proper authority.
- If multiple systems have access to the source volume, the swap task will indicate that a swap is beginning and will wait for the monitor tasks on the other systems to acknowledge that they are ready to participate. On some types of disk hardware, the swap task can determine how many systems have access to the source disk, on others it will depend on the user to specify the proper #SYSTEMS= value.
- Each monitor task will acknowledge that it has access to both the source and target devices, that the target is offline, and that they are ready to participate. If a system can access the target device but not the source volume, the monitor task will indicate that it does not need to participate.

300.02 CONTINUED . . .

SWAP PHASES (Continued)

- When the proper number of monitor tasks have acknowledged that they are ready to participate, the swap task proceeds. If the expected number of systems have not acknowledged within a time limit, this probably means that an FDRPAS monitor task for the target device was not running on all required systems, that the target was not offline on one or more systems, or that one or more systems does not have access to the target. You must run a monitor task on every system that has access to the source volume, even if it is offline, and those systems must also have access to the target device. FDRPAS will ask the system operator if it should continue with the swap even though the expected number of systems are not participating, via a WTOR with message FDRW68. The operator should not reply YES unless they are sure that the additional systems are not required; if they are required, start the necessary monitor tasks and reply RETRY. Note that if the monitor task was running but did not pick up the target device because it was online, you must stop and restart the monitor, or submit a new monitor, after varying it offline.

PHASE 2, ACTIVATION: the swap task signals that phase 2 has begun. On each system, FDRPAS will temporarily suspend all application and system I/O to the source device and install an I/O intercept to monitor updates to the source volume. When this is done on all systems, I/O is allowed to proceed. The swap has now begun. The time required to complete Phase 2 will vary depending on the number of systems involved.

PHASE 3, COPY: the swap task will copy data tracks from the source volume to the target device, reading and writing up to 15 tracks per I/O.

- the first pass of the Phase 3 copy will copy all tracks on the source volume. Only tracks currently allocated to a data set will be copied, plus tracks in the VTOC, VTOC index, VVDS and volume label. For physical sequential (PS), partitioned (PO), and VSAM data sets, only used tracks will be copied unless those data sets are allocated to some job or task at the beginning of the swap, in which case all allocated tracks are copied.
- while the Phase 3 copy is progressing, the I/O intercepts on each system are monitoring I/Os to the source volume to identify tracks which are updated. At the end of each pass of Phase 3, a consolidated list of updated tracks is collected (see Phase 4) and an additional pass of Phase 3 is made to re-copy those updated tracks. These additional Phase 3 passes will continue until the number of tracks remaining to be copied is small.
- Before a track is copied, FDRPAS will check to see if the I/O intercept on the system running the swap task has determined that the track was updated during the current pass, and will defer copying the track until the next pass. This avoids unnecessarily copying tracks that will just need to be re-copied.

300.02 CONTINUED . . .

SWAP PHASES (Continued)

PHASE 4, UPDATE CONSOLIDATION: at the end of each Phase 3 copy pass, phase 4 is entered and the swap task requests a list of updated tracks from each monitor task. I/O to the source volume is suspended briefly on all systems while this information is collected. A consolidated list of tracks updated on all systems is formed. FDRPAS determines if it can complete the swap:

- If the number of tracks in the list is above a threshold, Phase 3 is re-entered to re-copy the updated tracks. Note that after every Phase 3 pass, the threshold value is increased, in case the rate of updates to the source volume is very high.
- If the number of tracks in the list is below the threshold or there are no updated tracks in the list, then FDRPAS is ready to complete the swap.
- if CONFIRMSWAP=YES was specified on the SWAP statement, then you don't want the swap to complete until you tell it to, so FDRPAS will simply re-enter Phase 3 to copy the updated tracks (Innovation does not recommend the use of CONFIRMSWAP=YES). This will continue until you confirm the swap (if the number of updated tracks again rises above the threshold, the volume will no longer be "ready to swap" until it falls again). If there are no tracks in the update list, FDRPAS will simply wait for an interval and test for updates again. You can confirm the swap in two ways: the FDRPAS ISPF panels can be used to monitor the progress of the swaps and confirm the swap of one or more volumes, or you can submit a MONITOR TYPE=CONFIRMSWAP job to wait for one or more disks to become ready for completion and automatically confirm the swap. CONFIRMSWAP=YES will not result in any console message or WTOR.
- If CONFIRMSWAP=NO was specified or defaulted, then FDRPAS will automatically complete the swap as soon as the number of updated tracks in Phase 4 falls below the current threshold.
- On every system, FDRPAS will disable all application and system I/O to the source volume, then will enter Phase 3 for one last pass to copy the remaining updated tracks (unless the updated track list is empty). Depending on the current value of the threshold and the number of tracks in the list, I/O will be suspended from as little as a few seconds to, in the worst case, a minute or more. This quiesce time will depend on the number of participating systems and the number of updated tracks to be copied.

PHASE 5, SWAP COMPLETION: at this point the source and target devices are completely synchronized. On every system, FDRPAS will invoke operating system services to swap the devices. The volume will now appear to be mounted on the target device which is now online, all future I/O will be directed to the target device, and all jobs, tasks and users which have the volume allocated will now be pointed to the target device. The original source device is placed offline and its volume label is modified so that it cannot be accidentally placed online again. FDRPAS will remove its I/O intercepts on all systems and re-enable I/O to the volume. The swap is complete.

300.02 CONTINUED . . .

AUTOMATIC SWAP TERMINATION

If the monitor task on any system fails to respond in any phase of the swap (except Phase 5), the swap task will automatically terminate the swap. This probably means that a monitor task has abnormally terminated or been cancelled, or a system involved in the swap has crashed or been shut down.

Similarly, if the swap task is abnormally terminated or cancelled, or the system executing the swap task crashes or is shut down, the swap is terminated.

If an I/O is issued to the source volume on any system that contains CCWs which are not recognized by FDRPAS, the swap will be terminated, since FDRPAS cannot tell if that I/O has updated the source volume, or what tracks it has updated. This probably means that the source volume disk subsystem supports special vendor-specific CCWs for functions which are unknown to FDRPAS. In this case, FDRPAS will print some diagnostic information about the suspect CCW chain and the job that issued it. You should contact Innovation with this printout so that we can attempt to identify the CCWs and enhance FDRPAS to handle them properly. If you can determine that the job has used functions that are restricted during a FDRPAS operation (such as concurrent copy, see section 320), you may be able to re-execute FDRPAS at a time when those functions are not in use.

WARNING: if a system with access to the source volume is IPLed (activated) or an offline source volume is varied online on some system while a swap is in progress for that volume, FDRPAS will not be invoked on that system and it will not participate in the swap. FDRPAS may be unable to tell that this has occurred, so when it enters Phase 5, the volume will not be swapped on this new system and updates to that volume on that system will be done on the wrong device; if FDRPAS can detect that the IPL or VARYON has occurred, the swap will be terminated in Phase 5. You should avoid IPLing systems during FDRPAS swaps unless they do not have access to the source volumes involved. You should not VARY volumes involved in swaps online.

ELIGIBLE VOLUMES FOR SWAP

All volumes are eligible to be swapped except for those containing active local page or swap data sets. These volumes can be moved by creating and activating new page data sets on other volumes and deactivating those on the volumes to be swapped.

The system residence (IPL) volume can be swapped, but you must be sure to update your IPL parameters on all affected systems with the new IPL address before the next IPL.

JES3-managed volumes cannot be swapped. However, on a JES3 system, volumes which are managed only by MVS, not by JES3, can be swapped.

However, you should read the special considerations in Section 320 carefully, since there may be steps you need to take before moving certain volumes.

300.02 CONTINUED . . .

POINT-IN-TIME BACKUPS

When FDRPAS is used to create a point-in-time backup (the SWAPDUMP statement), the operation of FDRPAS is similar to the operation of a normal swap except that the volumes will not be swapped at the end of the operation. FDRPAS will simply terminate, leaving the target device with an exact copy of the source volume at the point that FDRPAS ended.

You must start a FDRPAS SWAPDUMP operation for all volumes involved in the backup, well before the backup is to be taken to give FDRPAS time to synchronize all those volumes. Volumes involved in a SWAPDUMP backup cannot also be involved in a true swap, and no more than one SWAPDUMP can be in operation for a given volume at one time.

Normally, you will want to specify the CONFIRMSPLIT=YES operand on the SWAPDUMP statement. This operates identically to the CONFIRMSWAP=YES operand of the SWAP statement, causing FDRPAS to continue to operate even when the volumes are synchronized, recopying updated tracks as necessary to maintain the synchronization. When you are ready to take the backup of the volumes, you must "confirm" the volumes through the FDRPAS ISPF interface or by submitting a MONITOR TYPE=CONFIRMSPLIT statement, which will terminate FDRPAS and make the offline target volumes available for dumping.

FDRPAS SWAPDUMP supports FDRINSTANT backups with FDR and FDRDSF, and data set copies with FDRCOPY. It does not support ABR backups at this time.

CONFIRMSWAP AND CONFIRMSPLIT

By default, a SWAP operation (to actually move a volume) and a SWAPDUMP operation (to create a point-in-time backup) will complete automatically as soon as the source volume and target device are synchronized or when only a small number of data tracks remain to be synchronized. No operator or user intervention is required to complete the operation.

However, the CONFIRMSWAP=YES operand (for SWAP) and CONFIRMSPLIT=YES operand (for SWAPDUMP) can be used to allow the operator or user to control when the operation on a given disk volume will complete. If these operands are specified, then FDRPAS will enter an "idle" state when the devices are synchronized or close to synchronization. In this state, FDRPAS continues monitoring the source volume for updates and re-entering Phase 3 (as documented earlier) to periodically copy the updated tracks, to keep the devices in close synchronization. However, it will continue to do this indefinitely until it is instructed to complete the operation.

Why would you want to do this? For a SWAP, you will generally **not** want to use CONFIRMSWAP=YES unless you have some special reason for wanting to control when the swap to the new device actually occurs. When swapping a single volume, there is rarely any reason to do so, since you usually want the swap to complete as soon as possible. Even when swapping many volumes in parallel, you will usually want to let each volume swap as soon as it is synchronized. But if you have some reason that you need to co-ordinate the actual swaps, you can use CONFIRMSWAP=YES. **In most cases, you should omit CONFIRMSWAP=YES.**

For a SWAPDUMP, CONFIRMSPLIT=YES may make sense, since it allows you to control the time that the point-in-time backup will be frozen. It may be especially useful when creating point-in-time backups of many disk volumes, so that they can all be frozen approximately the same time.

CONFIRMSWAP=YES and CONFIRMSPLIT=YES do not result in any console messages or WTORs (although some users seem to expect that they will). You have two ways that you can tell FDRPAS to complete the operation:

- if you use the FDRPAS ISPF panels to monitor FDRPAS operations, the panels will tell you which SWAPs and SWAPDUMPs have used the confirm operand, and will also tell you when each volume has reached synchronization and is ready to confirm. You can then enter a command on the panel to confirm one or more disk volumes and complete their operations.
- If you want to automate the process, you can use a FDRPAS job or started task with the MONITOR TYPE=CONFIRMSWAP or TYPE=CONFIRMSPLIT statement, as documented in Section 310.07. This is followed by one or more MOUNT statements (Section 310.08) identifying disk volumes. When all of the volumes identified are in the "ready to confirm" state, they will all be confirmed automatically. This is an easy way to automatically complete the SWAP or SWAPDUMP operation for a set of volumes at the same time.

300.02 CONTINUED . . .

I/O PACING By default, FDRPAS will do I/O to the source and target devices as rapidly as the hardware and operating system allow. Up to 15 tracks will be read or written per I/O (unless overridden by BUFNO=). This allows FDRPAS to complete the swap of a volume very quickly. The swap of a 3390-3 typically completes in 5 to 15 minutes, depending on the number of tracks to be copied, source and target device types, etc.

If there I/O activity on the volume from other applications or the system, the FDRPAS I/O may have an impact, causing the I/O to be delayed or elongated. In most cases, this degradation is not noticeable; batch jobs using the volume may run a little longer and online users may see a slight increase in response time. Since the degradation will vanish as soon as the swap is complete, there is usually no need to be concerned about it. If you are swapping volumes to newer, faster hardware, response time will improve as soon as the swap is complete, so it is desirable to complete it as quickly as possible.

However, you may have an environment where online response time or batch service times are extremely important so that the FDRPAS degradation is not acceptable. The obvious solution is to run FDRPAS off-hours when the impact is not noticeable, but if that is not practical, FDRPAS includes I/O pacing options to reduce the impact of its I/O.

FDRPAS I/O Pacing works by inserting a time delay between WRITE I/Os to the target device. This also causes delays between READ I/Os on the source device (note that if the target hardware is significantly faster than the source, it may require large pacing delays before the source I/O is delayed).

Static I/O Pacing is invoked by specifying the PACEDELAY=nn operand on the SWAP or SWAPDUMP statement. This introduces a fixed delay of .nn seconds between WRITEs. The PACEDELAY value can also be interactively modified from the FDRPAS ISPF panels, even if it was not specified when the swap was started. So, if the FDRPAS I/Os are causing unacceptable degradation, you can change the pacing values up and down from the panels until you are satisfied with the results.

Dynamic I/O Pacing is invoked by specifying PACING=DYNAMIC on the SWAP or SWAPDUMP statement. When in use, FDRPAS uses an algorithm to gauge the impact of the FDRPAS I/Os on queue lengths and I/O delays on the source device. Every 15 seconds, it may increase or decrease the PACEDELAY value in use (from 0 to 50), depending on recent results. If you specify the PACEDELAY=nn operand, it is used as the initial pacing value; otherwise the initial value is determined by FDRPAS when the swap starts (the maximum initial value is 20). You can observe the pacing value from the ISPF panels, and you can change it if desired (FDRPAS will start adjusting the pacing from the new value).

Note: I/O pacing, either static or dynamic, will cause the swaps to take longer. In most cases, it is better to complete the swap as quickly as possible without using pacing. **Innovation recommends that you do not use static or dynamic I/O pacing unless you have experienced unacceptable degradation due to the use of FDRPAS.**

300.03 FDRPAS ON A SINGLE SYSTEM

SINGLE-SYSTEM OPERATION

When only a single OS/390 system image (CPU or LPAR) can access the DASD volume to be moved, FDRPAS operation is simple:

- You start an FDRPAS swap task for each source volume to be moved, specifying an offline disk as the target device. The swap task also acts as a monitor task.
- FDRPAS will copy tracks from the source volume to the target device.
- During the copy, FDRPAS will monitor all I/O operations to the source volume and will note all tracks which have been updated. Updated tracks will be copied (or re-copied, if they were previously copied) to the new device.
- When the copy is complete or the number of tracks remaining to be copied is below a threshold, FDRPAS will quiesce all I/O to the source device. The remaining tracks, if any, will be copied while all other I/O is quiesced. At this point, the target device will be an exact copy of the source volume.
- FDRPAS will swap all system pointers so that all future I/O to the volume will be directed to the target device. The original device will be placed offline and the volume label on that device modified so that it cannot be accidentally placed online.
- I/O to the volume is re-enabled and the FDRPAS swap task terminates.

Warning: you must be sure that the volume being swapped is not online to any other system or LPAR. If it is, you must treat this as a multi-system swap as described in the following section.

300.04 FDRPAS ON MULTIPLE SYSTEMS

MULTI-SYSTEM OPERATION

When multiple OS/390 system images can access the DASD volume to be moved, there are some additional steps, since the swap must be coordinated on all system images. All system images must be monitored for updates to the volume during the swap, and the final swap to the new device must be conducted simultaneously on all images. The sequence is:

- you must start an FDRPAS monitor task on all systems which have access to the target device, even if it does not have the source volume online. Each monitor task can be directed to monitor only a single target device, or a range of potential target devices. A disk device can connect to up to 128 systems, so FDRPAS supports up to 128 monitor tasks for a given swap.
- You start the FDRPAS swap task on any system, specifying the volume to be swapped and the output (target) device. For best performance, the swap task should run on the system with the highest level of update activity on the volume to be swapped.
- After validating the swap request, the FDRPAS swap task will indicate that the swap is pending.
- On the other system images, the FDRPAS monitor tasks will recognize that the swap is pending and indicate that they are ready to participate in the swap. If the monitor task is monitoring only a single target device, that task will handle the entire swap process. If it is monitoring multiple target devices, it will start a separate FDRPAS task for each volume when the swap begins.
- When the required number of monitor tasks have acknowledged their participation, the swap task will signal that the swap has begun. It will install the I/O intercept on its image to monitor updates.
- The monitor tasks will recognize that the swap has begun and install the I/O intercept on their images to monitor updates.
- When all monitor tasks have indicated that the intercepts are installed, the swap task will begin copying tracks from the original device to the target device.
- The FDRPAS intercepts on each system will monitor all I/O operations to the original device and will note all tracks which have been updated. Updated tracks will be copied (or re-copied, if they were previously copied) to the new device.
- When the copy is complete or the number of tracks remaining to be copied is below a threshold, FDRPAS will signal all monitor tasks to quiesce all I/O to the original device. The remaining tracks, if any, will be copied while all other I/O is quiesced. At this point, the target device will be an exact copy of the source device.
- The swap task will now signal all monitor tasks to swap all system pointers on all system images so that all future I/O to the volume will be directed to the new device. The original device will be placed offline and the volume label on that device modified so that it cannot be accidentally placed online.
- I/O to the new device is re-enabled, all I/O intercepts are removed, and the swap task terminates.

300.04 CONTINUED . . .

SYSTEM DETERMINATION

In a multi-system environment, one or more FDRPAS monitor tasks must be executed on every system image which has the source volume online; one of those monitor tasks must monitor the target device if it is in the I/O configuration of that system. If some systems are excluded, those systems will not be aware that FDRPAS has moved the volume to a new device, and FDRPAS will not be aware of updates to the volume which occur on the excluded systems during the swap. *This could have serious consequences, including data corruption and data loss.*

If you have systems in your complex which have the source volume online but *do not have access to the target device*, you must not attempt to swap the volume to that device.

FDRPAS attempts to determine how many systems have access to the source volume, in order to protect you against potentially disastrous errors in setting up the FDRPAS swaps. Depending on the disk hardware involved, FDRPAS may be able to identify the number of systems accessing the source volume and the CPU serial number of each system. However, if the number of systems can't be determined, or if you need to exclude certain systems from participating in the swap of a given volume, you will have to provide input to FDRPAS. Here are the steps that FDRPAS takes:

- On certain disk subsystems, including the IBM 3990-6, IBM RAMAC subsystems (except the RVA), IBM 2105 ESS (Shark), and those that emulate a 3990-6 or 2105, FDRPAS will be able to determine how many system images have access to the source volume (although it can't tell if the volume is online or offline). FDRPAS also knows the CPU serial number of each system.
- On most EMC Symmetrix subsystems, FDRPAS will be able to tell which systems actually have the source volume online.
- On subsystems where FDRPAS is unable to determine the number of systems accessing the source volume, including the IBM 3990-3 control unit, the EMC Symmetrix 4xxx, the IBM RVA, the StorageTek SVA/V960 and those that emulate a 3990-3, it is the responsibility of the user to tell FDRPAS how many systems are involved via the #SYSTEMS= operand; if you are not sure if #SYSTEMS= is required for a particular source volume, try omitting it and FDRPAS will tell you if it is needed. Be sure and read the description of #SYSTEMS= in Section 310.02 for details.
- Once the swap task signals that the swap is beginning, the monitor tasks on each system will register their participation. The swap task will verify that the proper number of systems are participating. If the CPU serial numbers of the systems are known, it will verify the serial number of each monitor task against the list of expected serials.
- If the expected number of systems (or CPU serials) do not participate, then FDRPAS may issue a special WTOR to the console (message FDRW68) indicating this condition. If the operator replies YES, the swap will continue despite the discrepancy. If NO is replied, the swap is terminated. The operator may also reply RETRY, which causes FDRPAS to wait some additional time to see if the expected number of systems finally participate. You can also reply to this message from the FDRPAS ISPF panels. **Do not reply YES without carefully verifying that all necessary systems are participating; failure to do so may result in data loss or corruption.**

300.04 CONTINUED . . .

SYSTEM DETERMIN-ATION (Continued)

In the most common configuration, where the source volume and the target device are in the I/O configuration of every system in your complex, you simply need to start a monitor task for the output device on every system, and the rest is automatic. If FDRPAS identifies systems that did not register, then the monitor task is not executing on those systems or it is not monitoring the target device; just fix that error and try again.

The process is more complex when the source volume and/or the target device are not in the I/O configuration of some of your systems, or the source volume is offline on some systems, but even then FDRPAS attempts to automate the process:

- if the source volume is not in the configuration or is offline on some systems, but the target device is in the configuration, you should execute a monitor task on those systems. The monitor task will see the swap request, determine that it does not need to participate in the swap because the source volume is not in use, and communicate that to the swap task. The swap task will count this as a responding system but will exclude it from swap processing.
- If the target device is not in the configuration of some systems, but those systems are connected to the system executing the swap task via GRS (a GRSplex) or MIM (a MIMplex), then you should execute a monitor task on those system, pointing it to some arbitrary range of offline devices to monitor. FDRPAS will use a series of cross-CPU ENQs (major names FDRPAS and FDRPASQ) to communicate that those systems do not need to participate.

WARNING: if some systems have the source volume online but do not have access to the target device, do not attempt to swap that volume unless you vary it offline on those systems first. It will not be accessible on those systems after the swap..

Only in the situation where some systems have the source volume offline but do not have access to the target device and are not connected to the swapping system by GRS or MIM, do you need to take special actions to allow FDRPAS to continue. This also applies some systems in your configuration are running non-MVS systems such as VM or Linux. If the disk subsystem is a 3990-6 or a 2105 or another that allows FDRPAS to determine the CPU serial numbers of the systems accessing the source volume:

- You can use the EXCLUDE CPUID= statement of FDRPAS (see Section 310.04) to specify the serial numbers of the systems that do not have the source volume online.
- You can specify the MIN#SYSTEMS= operand, giving the number of systems which do have the source volume online. As soon as that many systems have registered, FDRPAS will begin the swap, but it will display a warning message to confirm that there were more systems identified by the disk hardware. Use MIN#SYSTEMS= **only if you are certain** of the number of systems with the volume online; we recommend that you use console commands to verify that the volume is truly offline on other systems.
- You can just let FDRPAS run without special operands, and reply YES to the FDRW68 message as documented above. Note that this may take a few minutes while FDRPAS waits for systems to register.

If the disk subsystem is a 3990-3 or RVA/SVA/V960 that does not allow FDRPAS to determine the systems accessing the disk, see the description of the #SYSTEMS= parameter in section 310.02.

So, in many installations, all devices in all disk subsystems are defined to all systems in the complex, so executing FDRPAS is simply a matter of making sure that proper FDRPAS monitor tasks are running on every system.

In some installations, such as service bureaus and outsourcing sites, certain devices in disk subsystems may be deliberately omitted from the I/O configuration on some systems, to prevent inadvertent access. In these installations, more care must be taken to be sure that the requirements for FDRPAS are met.

300.05 FDRPAS HISTORY RECORDS

HISTORY RECORDS

So that you can display a history of the swaps that FDRPAS has performed, FDRPAS will create a history record for every successful swap. These history records are simple catalog entries in an ICF catalog. No special database is required. These names exist only in the catalog; no real data sets by these names are created.

The high-level index of the FDRPAS history records is the value specified for PASINDEX in the FDR option table in the FDRPAS load library. By default, the value of PASINDEX is "FDRPAS".

To record history records, you need to define an ICF user catalog (or choose an existing catalog to use) and associate an alias to that catalog in your master catalog; the alias name must match the value of PASINDEX. This catalog can be shared among the systems swapping volumes, or you can define a unique catalog on every system (or a mixture). FDRPAS swap and monitor tasks must have authority to create data sets starting with the PASINDEX into the aliased user catalog. If they do not, the history records will not be created but the swaps will run successfully.

If you choose not to record FDRPAS history records on one or more systems, then do not define an alias matching PASINDEX in the master catalog of those systems. You will receive a message indicating that the alias does not exist, but the swap will end normally.

The format of the cataloged data set name is:

```
pasindex.Svolser.Dyyyyddd.Thhmmss.sysname
```

documenting the volume serial that was swapped, the date and time of the swap, and the name of the system it was swapped on. If multiple systems are involved, a separate history record is created for each. For example,

```
FDRPAS.SPROD01.D2001003.T091242.PRODSYS
```

indicates that volume PROD01 was swapped on 2001/003 (January 3, 2001) at 09:12:42 on system PRODSYS.

Other fields in the catalog record will record the original device address of the volume, and the device address it was swapped to. Although you can display these catalog records with IDCAMS LISTCAT and other utilities, the internal fields with the device addresses will not be displayed by those utilities.

Without further action, history records will be retained indefinitely, but you can discard them simply by uncataloging them. You can automate deletion of old history records using the HISTORY TYPE=SWAP command of FDRPAS (see Section 310.09).

You can display the history records with HISTORY command of the FDRPAS ISPF panels, as documented in Section 310.31. Here is a sample:

```
---------------------------- FDRPAS Plug & Swap History  --- Row 1 to 3 of 3
COMMAND ===>                                                 SCROLL ===> PAGE

Command  Volume  Unit  Swapped    System     Date       Time
         Serial  Addr  to Unit
-------  ------  ----  -------   --------  ----------  --------
         PROD01  17CC  3BCC      CPUA      12/22/2000  16:42:34
         PROD01  17CC  3BCC      CPUB      12/22/2000  16:42:35
         PROD01  17CC  3BCC      CPUC      12/22/2000  16:42:32
```

300.10 FDRPAS CHECKLIST

This is a simple checklist of steps to swap one or more disk volumes to new disk hardware devices.

BEFORE YOUR FIRST SWAP

- ❑ Visit the Innovation web site at **www.innovationdp.fdr.com** to obtain the latest fixes and updates for FDRPAS, plus recommended maintenance from IBM and other vendors. Click on "FDRPAS Customers" and follow the instructions displayed.
- ❑ Install FDRPAS as shown in Section 380. Be sure to install the PASPROC cataloged procedure in a system procedure library, and assign the FDRPAS catalog alias to a user catalog so that FDRPAS can record history records.
- ❑ Run the LICENSE TYPE=SWAP job (see the example in Section 310.20) and forward the output to your Innovation sales representative or email it to: sales@fdrinnovation.com
- ❑ Please complete and fax the configuration information page at the end of this manual, or email it to support@fdrinnovation.com.

TO SWAP ONE OR MORE VOLUMES

- ❑ **IMPORTANT: Review Sections 320.01 and 320.02 for special hardware and software considerations which may affect your swap.**
- ❑ Instruct your system console operators not to reply to any FDRPAS console messages without your knowledge. Do not automate the replies to any FDRPAS console messages.
- ❑ Insure that the target device is defined in the configuration of every system image that uses the source volume to be swapped. The target device must be varied offline on every system but it **must not** be marked as offline in the I/O configuration. If the target device is in newly-installed hardware, you can use the dynamic I/O configuration function of HCD to add it to the configuration.
- ❑ If the source volume is currently in a disk subsystem, such as an IBM 3990-3, IBM RVA, StorageTek SVA/V960, EMC 4xxx or any that emulate a 3990-3, see the description of the #SYSTEMS= operand in Section 310.02.
- ❑ If the source volume is currently in a disk subsystem, such as an IBM 3990-6, IBM 2105 ESS (Shark), EMC 5xxx or 8xxx, or any that emulate a 3990-6 or 2105, FDRPAS can determine the system count automatically.
- ❑ Start one or more FDRPAS MONITOR TYPE=SWAP tasks on every system which has access to the source volume, as shown in the examples in Section 310.23. One of the monitor tasks must monitor the target device.
- ❑ Start a FDRPAS SWAP task on one system for each source volume to be swapped, as shown in the examples in Section 310.21. If necessary, specify the #SYSTEMS= operand. If the target device has more data cylinders than the source volume, specify LARGERSIZE=OK. If you want multiple disk volumes to swap all at the same time, specify CONFIRMSWAP=YES. These operands are explained in detail in Section 310.02.
- ❑ If you specified CONFIRMSWAP=YES (not recommended), you can submit a FDRPAS MONITOR TYPE=CONFIRMSWAP task on any system, specifying all of the volumes that are to be swapped at one time, as shown in the examples in Section 310.24. If you submit it while FDRPAS is still synchronizing the volumes, they will swap as soon as all the volumes are ready. You can also submit it after the volumes are synchronized, at the time you are ready to complete the swap. Alternately, you can use the FDRPAS ISPF panels (Section 310.31) to confirm the swaps. Note that CONFIRMSWAP=YES does not result in any console message or WTOR when the volume is ready to be confirmed; you can only detect that it is in this state by using the FDRPAS ISPF panels.

300.10 CONTINUED . . .

TO SWAP ONE OR MORE VOLUMES (Continued)

- ❑ After a successful swap, the original device can be powered off and disconnected, if that is your intention (after all devices on the subsystem have been swapped, of course). If you want to reuse the original device for some other purpose, you can do an offline INIT with the IBM ICKDSF utility to give it a new volume serial and build an empty VTOC, or use the FDRPASV1 utility (described in Section 320.02) to allow it to be remounted with its original serial, preserving the original data. You may want to keep the original device for a period of time after the swap as a backup of the swapped volume.
- ❑ Innovation strongly suggests that you retain the FDRPAS swap and monitor listings for at least a month after any swap. This not only serves as documentation of the swap, but if problems or concerns arise regarding the swapped volumes, the listings may be required in order that Innovation can investigate the situation. If you have automated SYSOUT management software, it may be necessary to request that the FDRPAS listings be retained.

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310.01 FDRPAS JOB CONTROL REQUIREMENTS

To execute FDRPAS swap or monitor tasks as batch jobs or started tasks, the following JCL statements are required. Please review the examples (sections 310.20-25) for a better understanding of the JCL requirements of FDRPAS.

EXEC STATEMENT Specifies the program name (PGM=FDRPAS), region requirement (REGION=0M is recommended), and optional PARM= field which may contain the first FDRPAS control statement. For example,

```
//SWAP EXEC PGM=FDRPAS,REGION=0M,
//      PARM='SWAP TYPE=FULL,LARGERSIZE=OK'
```

The parm may also contain a MOUNT control statement, separated from the first by a slash (/), e.g.,

```
PARM='SWAP TYPE=FULL/MOUNT VOL=PROD01,SWAPUNIT=17F4'
```

Note that there must be no space immediately before the slash. Additional control statements, if any, must be contained in the SYSIN data set.

STEPLIB or JOBLIB DD STATEMENT Specifies the load library in which FDRPAS resides. The library must be authorized. **FDRPAS must be executed with a JOBLIB or STEPLIB, it should never be put into the system linklist.**

SYSPRINT DD STATEMENT Specifies the output message data set; it is required. It is usually a SYSOUT data set but if it is assigned to a data set on tape or disk, this DD must specify DISP=MOD. DCB characteristics are RECFM=FBA and LRECL=121; the blocksize will default to 1210 on disk or tape.

SYSPRINx DD STATEMENTS Specifies an output message data set for an internal swap subtask; they are used only when MAXTASKS=nn is specified.. "x" will be 1-9, 0, and A-V, in that order, depending on the value of MAXTASKS=nn. They are optional; if needed, they will be dynamically allocated as SYSOUT=*, so you need to specify them only if you need to direct those messages elsewhere. It is usually a SYSOUT data set but if it is assigned to a data set on tape or disk, this DD must specify DISP=MOD. DCB characteristics are RECFM=FBA and LRECL=121; the blocksize will default to 1210 on disk or tape.

SYSPRTxx DD STATEMENTS Specifies an output message data set for an internal monitor subtask. SYSPRTxx DDs are used only in a FDRPAS step with a MONITOR TYPE=SWAP control statement; they are optional; if needed, they will be dynamically allocated as SYSOUT=*, so you need to specify them only if you need to direct those messages elsewhere. It is usually a SYSOUT data set but if it is assigned to a data set on tape or disk, this DD must specify DISP=MOD. DCB characteristics are RECFM=FBA and LRECL=121; the blocksize will default to 1210 on disk or tape.

FDREMAIL DD STATEMENT Specifies input control statements for the FDR e-mail facility. If present, e-mail messages can be sent for unsuccessful or successful FDRPAS operations. See Section 320.04 for requirements and details.

SYSUDUMP DD STATEMENT Specifies the abend data set. Usually a SYSOUT data set. A SYSUDUMP DD statement should always be included to assist in error diagnosis. If you have the ABEND-AID product from COMPUWARE also include the following so that a fully-formatted dump is produced: `//ABNLIGNR DD DUMMY`

SYSIN DD STATEMENT Specifies the control statement data set. Usually an input stream or DD * data set. It may be DUMMY if all necessary control statements are included in the PARM= on the EXEC statement.

310.01 CONTINUED . . .

USING PASPROC TO EXECUTE FDRPAS

As part of the installation of FDRPAS, you were required to edit a cataloged procedure (proc) for FDRPAS and store it in a system procedure library (see Section 380.05). This was required so that the FDRPAS monitor task can start additional monitor tasks as system started tasks. However you can also use this proc to execute FDRPAS in batch jobs or to start FDRPAS from a system console with a START (S) command. The default name of this proc is PASPROC but if you changed it during installation, substitute your name in the examples in this manual.

In a batch job, use JCL such as:

```
//SWAP   EXEC   PASPROC
//SYSIN   DD   *
    SWAP TYPE=FULL
    MOUNT   VOL=TS0123,SWAPUNIT=1234
```

From the console, use syntax such as:

```
S PASPROC.VTS0123,PARM='SWAP TYPE=FULL/MOUNT VOL=TS0123,SWAPUNIT=1234'
```

If your systems are part of a sysplex (basic or parallel), you can use the console ROUTE command to start monitor tasks on all systems in the sysplex. This can considerably reduce the amount of typing required. For example:

```
ROUTE T=0,*OTHER,S PASPROC.MON2,PARM='MONITOR TYPE=SWAP/MOUNT SU=2*'
```

will start the monitor task on all other systems in the sysplex (*OTHER assumes that you will start the swap task on this system, use *ALL to start the monitor task on all systems).

310.02 FDRPAS SWAP/SWAPDUMP/SIMSWAP STATEMENTS

SWAP	**TYPE=FULL**
SWAPDUMP	**,#SYSTEMS=**nnn
SIMSWAP	**,BUFNO=**nn
	,CHECKTARGET=YES|NO
	,CONFIRMSPLIT=YES|NO
	,CONFIRMSWAP=YES|NO
	,CONFMESS=YES|NO
	,EMSG=OK
	,LARGERSIZE=OK|NO
	,LOGMESS=YES|NO
	,MAXCARDS=nnnn
	,MAXTASKS=nn
	,MIN#SYSTEMS=nnnnn
	,PACEDELAY=nnnnn
	,PACING=STATIC|DYNAMIC
	,PRINT=ALL
	,SWAPDELAY=nnn
	,SWAPIOERR=RETRY|NORETRY

SWAP STATEMENT

This statement initiates an FDRPAS swap task to move a volume to a new disk device. It must be the first statement in the input; only one SWAP statement is allowed per execution. SWAP must be followed by one or more MOUNT statements to identify the online volumes to be swapped and may optionally be followed by one or more EXCLUDE statements to exclude certain systems which do not have a source volume online.

If multiple MOUNT statements are specified, by default FDRPAS will process them serially, one at a time. However, you can request that this swap task process multiple volumes concurrently, up to 32 at a time, by specifying the MAXTASK=nn operand. To swap more than 32 volumes concurrently, you must start multiple swap tasks.

A RACROUTE call will be issued to verify that the user has READ authority to resource FDRPAS.SWAP in the FACILITY class, if that resource is protected. If FDRPAS.SWAP is not protected, the operation will continue.

If you have security checking enabled (the ALLCALL option as shown in Section 380.04), SWAP checks that the user has at least ALTER authority to the source volser under the DASDVOL security class. If the user does not have DASDVOL authority, the operation will fail. If the volume is not protected by DASDVOL, FDRPAS will check that the user has ALTER authority in the DATASET class to every data set on the volume; if any dataset is not authorized the operation will fail.

310.02 CONTINUED . . .

SWAPDUMP STATEMENT

SWAPDUMP is similar to SWAP, except that the volume will not be swapped to the target device. It is used to create a point-in-time copy of the source volume on the target device, which can then be backed up with FDRINSTANT. All rules and considerations of SWAP also apply to SWAPDUMP.

You must start the SWAPDUMP Operation far enough ahead of the time you plan to do the backup so that FDRPAS can copy the data and synchronize the volumes. If you specify CONFIRMSPLIT=YES, FDRPAS will then continue to keep the volumes synchronized until you "confirm" the operation and create the frozen point-in-time copy, at which time you can submit the FDRINSTANT backup jobs.

MAXTASKS=nn is especially useful for SWAPDUMP, where you may need to create point-in-time backups of a large number of disk volumes, all at the same point-in-time. MAXTASKS=nn allows you to SWAPDUMP up to 32 disk volumes in a single swap job or started task, so that the number of jobs/tasks required to synchronize all of those volumes is small.

A RACROUTE call will be issued to verify that the user has READ authority to resource FDRPAS.SWAPDUMP in the FACILITY class, if that resource is protected. If FDRPAS.SWAPDUMP is not protected, the operation will be allowed.

If you have security checking enabled (the ALLCALL option as shown in Section 380.04), SWAPDUMP checks that the user has at least READ authority to the source volser under the DASDVOL security class. If the user does not have DASDVOL authority, the operation will fail. If the volume is not protected by DASDVOL, FDRPAS will check that the user has READ authority in the DATASET class to every data set on the volume; if any data set is not authorized, the operation will fail.

SIMSWAP STATEMENT

SIMSWAP performs a simulation of a SWAP operation. It accepts all of the operands and statements of a SWAP operation but it will not actually perform a swap. It does not require monitor tasks on other systems; if monitors are running they will not participate.

SIMSWAP has 3 uses:

1) it validates all of the operands which will appear on the SWAP statement
2) it validates the online volumes and offline target devices specified on the MOUNT statements. This will identify errors such as the target device does not exist or is not offline or is the wrong type or size
3) for disks in subsystems where FDRPAS can determine the systems with access to the source volume, it will display all of the identified systems, including their CPUIDs, in FDR233 messages. You can verify that all of the systems you expect have access, and that there are no unexpected systems with access. It will also indicate subsystems where FDRPAS cannot determine the attached systems; the #SYSTEMS= operand is required when swapping such disks.

310.02 CONTINUED . . .

OPERANDS

TYPE=FULL Must be specified on the SWAP or SWAPDUMP Statement.

#SYSTEMS= specifies the number of system images (CPUs or LPARs, 1 to 128) which will be involved in the swap of a disk on certain hardware. If the source volume is in certain disk subsystems, #SYSTEMS= is required, on all others it is ignored. If the # (pound sign) character is not in your local character set, you can use the alternate operand NSYSTEMS=.

If the source is in an IBM 3990-3, IBM RVA, StorageTek SVA/V960, EMC Symmetrix 4xxx or any subsystem that emulates a 3990-3, you must specify #SYSTEMS=. If you omit #SYSTEMS= and FDRPAS is unable to determine the number of systems, it will terminate with a diagnostic message and you will need to resubmit the SWAP job with #SYSTEMS= specified. **It is extremely important that you specify #SYSTEMS= accurately.**

In the simplest case, if all of your systems have the source volume in the I/O configuration, even if it is offline, then you should run a FDRPAS monitor task on each of those systems that is IPLed. Specify #SYSTEMS= equal to the number of monitor tasks. Remember that all those systems must also have the target device in the I/O configuration.

If some of your systems have neither the source nor target device in their configuration, those systems do not have to participate in the swap. If the rest of the systems have both the source and target devices accessible, run monitor tasks on those systems and specify #SYSTEMS= equal to the number of monitor tasks.

If some of your systems do not have the source volume in the I/O configuration but do have the target device (more systems can see the target than can see the source), then you should run a FDRPAS monitor task on every system that has the target device in the configuration (even those without the source device) and specify #SYSTEMS= equal to the number of monitor tasks.

Here are some examples, assuming you have 5 systems:

1) if all 5 systems can access both the source and target devices, and all 5 are IPLed, run monitors on all 5 and specify #SYSTEMS=5.

2) if 2 of the systems are not running (not IPLed), run monitors on the remaining 3 and specify #SYSTEMS=3.

3) if 2 of the systems do not have the source device in their configuration, but all 5 have access to the target device, run monitors on all 5 and specify #SYSTEMS=5

4) if 3 of the systems have neither the source nor the target device in their configuration, run monitors on the remaining 2 and specify #SYSTEMS=2.

An FDRPAS monitor task must be executing, monitoring the target device, on each of those systems. If the expected number of systems (monitor tasks) do not indicate their participation within a time limit, FDRPAS will issue a FDRW68 WTOR to the system operator, who can allow the swap to continue with the lesser number of participating systems, to terminate the swap, or to wait an additional time for more systems to participate. You can also reply to this message from the FDRPAS ISPF panels.

310.02 CONTINUED . . .

BUFNO= Specifies the number of I/O buffers that FDRPAS will use while copying data from the source volume to the target device, from 2 to 32. It should be an even number and will be rounded up if odd. FDRPAS will divide this buffer set in half, in order to overlap input and output I/Os. With BUFNO=32, FDRPAS will read and write up to 15 tracks per I/O; with lesser values, it will do half of the BUFNO= value in tracks per I/O. Reducing BUFNO= will reduce the elapsed time of each I/O, and thus reduce the impact of each I/O on your I/O system, but it will increase the number of I/Os required to copy the data, and thus increases the total time to do the swap.

Innovation does not recommend specifying BUFNO= unless the length of the FDRPAS I/Os are causing problems. For example, certain hardware channel extenders may experience errors on extremely long I/O chains, causing the swap to fail. Reducing BUFNO= may allow the swap to work. If many FDRPAS swaps are running concurrently, the length of each individual FDRPAS I/O may impact overall system performance; reducing BUFNO= may decrease this impact (but also see PACEDELAY=).

The default is 32.

CHECKTARGET= **YES** – FDRPAS will check the target device before beginning a SWAP or SWAPDUMP operation to insure that the target is empty. The operation will be terminated if the target contains any data sets other than a VTOC, VTOC index (SYS1.VTOCIX.xxxxxx) or VVDS (SYS1.VVDS.xxxxxx). Disks that do not contain a valid volume label (such as those which have never been used since they were delivered or defined) are also accepted.

NO – the target volume will not be checked. It will be overlaid regardless of its current contents.

The default is NO.

Note: CHECKTARGET=YES is not recommended. FDRPAS will not modify a target volume unless it is offline to every system, so if a target device which is offline to one system but online to others is specified, the swap will fail even if CHECKTARGET=NO is specified or defaulted. The only possible exposure occurs when a volume containing valid data is offline to every system and is accidentally specified as a FDRPAS target; this is unlikely. If you are using FDRPAS for I/O load balancing, do not specify CHECKTARGET=YES since the target device will probably contain data sets from its previous use.

310.02 CONTINUED . . .

CONFIRMSPLIT=
CONFIRMSWAP=

CONFIRMSPLIT= is used only with the SWAPDUMP statement, and CONFIRMSWAP= is used only with the SWAP statement, but they function identically. CO= is a valid abbreviation for either operand. **CONFIRMSWAP=YES should be used only when you have a need to complete the swap of a number of volumes at the same time; if it is not important when the swap of each individual volume completes, use the default of CONFIRMSWAP=NO**

YES – FDRPAS will not complete the swap or dump of this volume until you confirm that you are ready to do so. The operation will continue through Phases 1 through 4 (see Section 300.02) and then will wait, copying updated tracks as required, until you confirm that the operation is to be completed, using the FDRPAS ISPF panels (see Section 310.31) or a MONITOR TYPE=CONFIRMSWAP or CONFIRMSPLIT job (see Section 310.07). With SWAPDUMP, CONFIRMSPLIT=YES can be used to continue updating the duplicate volume until you are ready to create the point-in-time backup.

NO – FDRPAS will complete the operation as soon as the source and target devices are in synchronization, without waiting for any confirmation. CONFIRMSWAP=NO is recommended for a SWAP operation unless you have a need to swap a set of volumes at the same time.

The default is NO.

Note that CONFIRMSPLIT=YES and CONFIRMSWAP=YES do not result in any console message or WTOR when the volumes are ready for the swap or split to complete. You can only tell when they are in this state by using the FDRPAS ISPF panels, and you can confirm the operation only by using the ISPF panels or the MONITOR TYPE= CONFIRMSWAP or CONFIRMSPLIT statement.

CONFMESS=

YES – before beginning the swap, FDRPAS will request confirmation via a WTOR (FDRW01) message to which the MVS operator must reply. You can also reply to this message from the FDRPAS ISPF panels.

NO – suppresses the WTOR and begins the swap immediately.

CM= is a valid abbreviation for CONFMESS=.

Default: NO.

EMSG=

Used when the FDR e-mail notification facility has been invoked by including a FDREMAIL DD statement in the FDRPAS execution JCL.

OK - e-mail notifications will be sent from successful SWAP and SWAPDUMP operations as well as failures.

Default: e-mail notifications will be sent only for SWAP and SWAPDUMP failures.

310.02 CONTINUED . . .

LARGERSIZE= **OK** – the target device may have more data cylinders than the source volume. This allows you to swap from one model of a disk to a larger model. For example, you can swap from a 3390-2 (2226 cylinders) to a 3390-3 (3339 cylinders). The volume size will be updated in the VTOC and VTOCIX (if active), as well as all in-storage tables, when the devices are swapped. However, there is a small chance that the VTOCIX index will be disabled during the swap; if so, you can use the FDRPAS SWAPBUILDIX utility function, described in Section 310.11, to rebuild it even while the volume is in use on multiple systems. Note that if the target device is larger than the source, you will receive a FDRW66 message with the "OVERRIDE OF WARNINGS" text. FDRPAS will invoke ICKDSF to update the volume size; if you have restricted the use of ICKDSF, then the FDRPAS swap job must be authorized to use it.

NO – the output device must have the same number of data cylinders as the source volume. The output device does **not** have to have the same number of alternate cylinders as the source volume; if the number of alternates is different, FDRPAS will correct the alternate count after the swap.

WARNING: if you swap to a "large disk" (from 10018 to 32760 cylinders in size) you must have the proper IBM support for large disks installed on all systems participating in the swap. Failure to do so will have unpredictable results.

Default: NO.

LOGMESS= **YES** – messages will be written to SYSLOG (and usually to an operator console) documenting that the swap is occurring, and has completed.

NO – no SYSLOG/console messages are written.

Default: YES for the SWAP statement and NO for the SWAPDUMP statement.

MAXCARDS= specifies the maximum number of MOUNT statements that can be present in this FDRPAS step, from 1 to 9999. Note that FDRPAS acquires a table with a size of 160*MAXCARDS in below-the-line storage, so very large values may cause GETMAIN failures.

The default is 250.

310.02 CONTINUED . . .

MAXTASKS= specifies the maximum number of volumes which can be processed concurrently by this swap task, from 1 to 32. You must follow the SWAP statement with multiple MOUNT statements, specifying the volumes to be processed. If the number of MOUNT statements exceeds MAXTASKS=nn, FDRPAS will start the indicate number of swaps; as each one finishes another one will be started, until all MOUNTs have been processed. The FDRPAS ISPF panels can be used to terminate active swaps individually.

In order to separate the messages from these swaps, messages will be written to SYSPRINx DD statements ("x" will be 1-9, 0, and A-V in that order, depending on MAXTASKS=nn). If you have not provided these DDs in the SWAP task JCL, they will be dynamically allocated as "SYSOUT=*". At the termination of each swap subtasks, most of its messages will also be written to SYSPRINT so that all FDRPAS messages are in one place.

The default is that only one volume will be swapped at a time. If multiple MOUNT statements are provided, they will be processed serially. All messages are written only to SYSPRINT.

Note: if you run multiple concurrent swaps, either through MAXTASKS= or by running multiple swap jobs, you should consider the total impact on your system. For example, if you run many swaps against the same source or target control unit, it may overload the control unit or the channels to that control unit. The impact is very dependant on your hardware configuration, so there are no hard guidelines, although some customers have run 20 or more concurrent swaps.

MIN#SYSTEMS= specifies the minimum number of system images (CPUs or LPARs, 1 to 128) which must participate in the swap of the volumes in this step. MIN#SYSTEMS= can be used only when the source volume is in a disk subsystem where FDRPAS can determine from the hardware the number of systems which have access to the volumes (where the #SYSTEMS= operand is not required), but when you are **certain** that some of those systems do not have the volume online. For example, if the hardware reports that 10 systems can access the volumes but you are certain that 3 of those systems have the source volume offline, specify the MIN#SYSTEMS=7 to allow the swap to proceed without operator intervention. **Innovation suggests that you use console commands or similar displays to verify the number of systems which have the volume online.**

If the # (pound sign) character is not in your local character set, you can use the alternate operand MINNSYSTEMS=.

You can alternately use the EXCLUDE statement (Section 310.04) to specify the CPUID of systems which do not have the volume online.

If you do not specify MIN#SYSTEMS= or EXCLUDE in this circumstance, FDRPAS will issue a console WTOR message FDRW68 asking the operator to confirm that the swap should continue without the participation of the missing systems.

A FDRPAS monitor task must be running on each of the systems which will participate in the swap.

310.02 CONTINUED . . .

PACEDELAY= specifies the number of hundredths of a second (1-32767) that FDRPAS will wait between WRITE I/Os on the target device, in order to minimize the impact of the background copy operation on other applications (each copy I/O will copy up to 15 tracks of source data). In most cases, a value between 1 and 20 should be sufficient. The PACEDELAY can be dynamically modified for a specific volume from the FDRPAS ISPF panels, as described in Section 310.31. If PACING=DYNAMIC is also specified, the PACEDELAY= value is used as the initial pacing delay, and FDRPAS will adjust it dynamically.

The default is 0 (no pacing delay).

PACING= **STATIC** – static I/O pacing will be used for FDRPAS I/O. If PACEDELAY= is also specified, FDRPAS will insert the indicated time delay between each WRITE to the target device. The PACEDELAY value can be displayed and interactively modified from the FDRPAS ISPF panels.

DYNAMIC – FDRPAS uses an algorithm to gauge the impact of its I/Os on I/O queue length and I/O delay for other tasks on the source volume. Every 15 seconds it may adjust the PACEDELAY= value in use depending on recent results. If PACEDELAY= is also specified, that is used as the initial value; otherwise FDRPAS determines the initial value when the swap starts. If possible, run the swap on the system with the highest level of update activity for the volume when dynamic pacing is used.

Default is STATIC. If PACEDELAY=0 is specified or defaulted, no I/O pacing will be done (unless modified from the ISPF panel during the swap).

WARNING: Innovation recommends that you do not use static or dynamic I/O pacing unless you have experienced unacceptable degradation due to the use of FDRPAS. PACEDELAY and dynamic pacing will cause the swaps to take longer.

PRINT=ALL Requests additional printout from the swap task, including a list of all data sets on the source volume, and a detailed list of the tracks copied in each phase.

SWAPDELAY= specifies the interval in seconds (1-255) that FDRPAS will wait between checks to see if all the system images (as determined by FDRPAS or specified by #SYSTEMS=) have indicated that they are ready to swap the volume. FDRPAS will make this check up to 30 times; if all expected systems have not joined in the swap by the 30th check, FDRPAS will terminate the swap. This may indicate that an FDRPAS monitor task was not monitoring the target volume on every system. The value specified should be 3 or more times the value specified for SWAPDELAY= on the MONITOR statement in the monitor task.

The default is 15 seconds (the default on the MONITOR statement is 5 seconds). The default should be adequate unless you have a large number of systems participating in the swap process, in which case more time may be required for all systems to join.

310.02 CONTINUED . . .

SWAPIOERR= **RETRY** – an I/O error on the target device while copying tracks will cause the swap to stop copying and retry the I/O error every 5 seconds until it is successful or until the swap is terminated (by the ABORT command on the FDRPAS ISPF panels or a console CANCEL command). This allows a swap to recover and continue when the target device has an error which can be corrected. It is intended for use when the target device is connected over a channel extender; if the remote link is interrupted and later recovered, FDRPAS will automatically wait for the repair and continue.

When the first such I/O error occurs, FDRPAS will put a non-scrollable message (FDR210) on the console to document that it is in the retry loop. IBM I/O error messages will be suppressed for the retry I/Os so they will appear only for the original error. FDR210 will appear again when the error is successfully corrected.

NORETRY – an I/O error on the target device while copying tracks will immediately terminate the swap. If the I/O error is later corrected, the swap must be restarted.

Default is NORETRY.

310.03 FDRPAS SWAP MOUNT STATEMENT

MOUNT **VOL=**volser

,SWAPUNIT=uuuu

MOUNT STATEMENT

The swap MOUNT statement follows the SWAP TYPE=FULL statement and specifies an online volume to be swapped. One or more MOUNT statements are required, specifying the volumes to be swapped by this swap task.

If MAXTASKS=nn was specified on the SWAP or SWAPDUMP statement, and multiple MOUNT statements are provided, those MOUNTs will be processed concurrently, up to the MAXTASKS=nn limit. If the number of MOUNTs exceed "nn", FDRPAS will process the first "nn" MOUNTs concurrently, and will select the next MOUNT statement as each swap ends.

If MAXTASKS=nn is not specified, the MOUNT statements will be processed serially, one at a time.

OPERANDS

VOL= Specifies the volume serial of an online volume to be swapped.

SWAPUNIT= Specifies the MVS device address of the target device, the new disk unit to which this volume will be swapped. You must specify this as a 4-digit address, with a leading zero if required. This device must be offline on all systems involved in the swap. SU= is a valid abbreviation for SWAPUNIT=.

It is possible to specify an asterisk (*) for any digit of the SWAPUNIT= address. FDRPAS will substitute the corresponding digit of the MVS address of the source volume (the volume specified by VOL=). For example, if the MVS address of volume PROD01 is 03A4:

`MOUNT VOL=PROD01,SWAPUNIT=17C*` will swap to device 17C4

`MOUNT VOL=PROD01,SWAPUNIT=17*2` will swap to device 17A2

`MOUNT VOL=PROD01,SWAPUNIT=17**` will swap to device 17A4

This feature allows you to easily swap a set of volume on adjacent addresses (a “string” of disk volumes) to a set of adjacent addresses in the new disk subsystem.

310.04 FDRPAS SWAP EXCLUDE STATEMENT

EXCLUDE **CPUID=**cpuid

X

EXCLUDE STATEMENT

The swap EXCLUDE statement optionally follows the SWAP TYPE=FULL statement and specifies the hardware CPU serial number of a system image where the source volume is known to be offline or not in the I/O configuration. One or more EXCLUDE statements can be specified.

You should use the EXCLUDE statement only when:

the source volume is in a disk subsystem where FDRPAS can determine the CPU IDs of the systems which have access to the subsystem. This includes the IBM 3990-6, IBM RAMAC subsystems (except the RVA), IBM 2105 ESS (Shark), and other subsystems which emulate one of these IBM systems. Note that on most EMC Symmetrix subsystems, FDRPAS can determine which systems actually have the source volume online, so EXCLUDE statements should not be required when the source volume is in a Symmetrix.

One or more systems have the source volume offline, or the device containing the source volume is not in the I/O configuration of one or more systems.

When both of the above are true, the EXCLUDE statement can be used to tell FDRPAS that those systems do not have to participate in the swap.

OPERANDS

CPUID= Specifies the 10-character CPU serial number of a system image which does not need to participate in the swap.

To get the CPU serial number of a system, execute this console command from a console attached to that system:

```
D M=CPU
```

You will get a response similar to:

```
IEE174I 10.54.11 DISPLAY M

PROCESSOR STATUS

ID  CPU                 SERIAL

0    +                  0309417060

1    +                  1309417060
```

Note that the first digit may be non-zero if you have a multi-processor system, as shown in this example. Always make the first digit zero when specifying CPUID=. For example, CPUID=0309417060.

310.05 FDRPAS MONITOR SWAP STATEMENT

MONITOR **TYPE=SWAP**
,DURATION=nnnn
,LOGMESS=YES|NO
,MAXTASKS=nn**|64**
,PRINT=ALL
,SWAPDELAY=nnn

MONITOR STATEMENT

This statement initiates an FDRPAS monitor task which monitors for FDRPAS swap tasks beginning a SWAP or SWAPDUMP operation. It must be the first statement in the input; only one MONITOR statement is allowed per execution.

A MONITOR TYPE=SWAP statement must be followed by exactly one MOUNT statement to identify the offline devices to be monitored. This type of MONITOR must be executed **on every system** that will be involved in the swap of an online volume to one of those offline volumes; however, the monitor task will not actually participate on the system where the swap task is running.

Note that MONITOR will not monitor devices that are online when the monitor task starts but are put offline *after* it starts. To monitor such devices, you must cancel and resubmit the monitor task, or submit another monitor job which includes the newly offline devices.

If this monitor task is monitoring only one offline device (as specified by the following MOUNT statement), then all monitoring will be done by this monitor task; no external or internal tasks will be started.

If the MOUNT statement specifies more than one offline device, then this monitor task will monitor all of those devices, but if it detects that a swap may be beginning on one of them, it will start an internal subtask or external started task to participate in the swap.

If MAXTASKS=nn is specified (or defaulted to 64), then up to "nn" active swaps will be processed as internal subtasks. If the number of monitored devices actively participating in swaps exceeds the value specified or defaulted for MAXTASKS=, the additional monitor functions will be processed as external started tasks. FDRPAS uses the IBM ASCRE function to create a new started task address space for each monitor task, invoking the PASPROC cataloged procedure (see the installation instructions in Section 380.05).

Since these external monitor started tasks are separate address spaces, they will count against the maximum number of address spaces allowed by the MAXUSER= parameter in the IEASYSxx PARMLIB member used during the IPL of your OS/390 or z/OS system. If a large number of such external tasks are started, some may fail if MAXUSER is exceeded, and it may affect the ability to start other tasks or users.

310.05 CONTINUED . . .

OPERANDS

TYPE= Must be specified on the MONITOR Statement.

SWAP - initiates a monitor task which will monitor offline volumes for a swap operation initiated by a swap task.

DURATION= Specifies the number of idle minutes that the monitor task will execute; it does not include time that the monitor task is actively participating in a swap. It will automatically terminate when it has been idle for a total of this many minutes.

The default is that the monitor task will execute until it is cancelled, or until all devices that it is monitoring have been swapped or are online.

LOGMESS= **YES** – messages will be written to SYSLOG (and usually to an operator console) documenting that the swap is occurring, and has completed.

NO – no SYSLOG/console messages are written.

Default: YES.

MAXTASKS= Specifies the number of internal monitor subtasks (0-64) that FDRPAS will start within this address space. If more than this number of volumes are being swapped at one time, the additional monitor tasks will be started as external started tasks. See the additional explanation above.

The default 64.

PRINT=ALL Requests additional printout from the monitor task, including a detailed list of the tracks updated in each phase.

SWAPDELAY= specifies the number of seconds (1-255) that FDRPAS will wait between scans of the offline devices it is monitoring to see if an FDRPAS swap task has selected one of them as a swap target. The value specified 1/3 or less of the value specified for SWAPDELAY= on the SWAP statement in the swap task.

The default is 5 seconds (the default on the SWAP statement is 15 seconds). The default should be adequate unless you have a large number of systems participating in the swap process.

310.06 FDRPAS MONITOR SWAP MOUNT STATEMENT

MOUNT **SWAPUNIT=(**uuu1,uuu2,…)

MOUNT STATEMENT

The monitor MOUNT SWAPUNIT= statement follows the MONITOR TYPE=SWAP statement and specifies an offline target device or set of devices to be monitored to see if one or more of them is selected as the target of a swap by an FDRPAS swap task on another system image. Only one MOUNT statement can be specified, specifying the devices to be monitored by this monitor task.

The monitor task will automatically terminate if it detects that all the devices you have specified on the MOUNT statement have been swapped or are no longer offline.

OPERANDS

SWAPUNIT= Specifies the MVS device address(es) of the target device(s) to be monitored. The address can be specified as a 4-digit (hex) MVS device address, or it can be specified as 1, 2 or 3 digits with a trailing asterisk(*); in this case all offline MVS disk addresses starting with the prefix specified will be monitored. To monitor multiple devices or ranges of devices, specify them in parentheses, separated by commas, but you cannot specify more than 255 devices or ranges (the total number of devices to monitor can exceed 255). Only devices which are offline will be monitored; if a device is placed offline after the monitor task starts, it will not be monitored.

Note: if the range to be monitored includes devices which are in your I/O configuration but which do not really exist (are not in the hardware configuration of the disk subsystem), you may receive this console message

IOS002A dev, NO PATHS AVAILABLE

for each such device the first time that the monitor task is executed after an IPL. The messages can be ignored. They may occur only under certain releases of OS/390.

For example,

MOUNT SWAPUNIT=17C0	monitors offline device 17C0
MOUNT SWAPUNIT=17C*	monitors offline devices 17C0-17CF
MOUNT SWAPUNIT=17*	monitors offline devices 1700-17FF
MOUNT SWAPUNIT=(17*,18*,19A*)	monitors offline devices 1700-17FF, 1800-18FF AND,19A0-19AF

310.07 FDRPAS MONITOR CONFIRM STATEMENT

MONITOR TYPE=CONFIRMSWAP|CONFIRMSPLIT

MONITOR STATEMENT

This statement initiates an FDRPAS monitor task which monitors for FDRPAS operations which specify CONFIRMSWAP=YES or CONFIRMSPLIT=YES. It must be the first statement in the input; only one MONITOR statement is allowed per execution.

A MONITOR TYPE=CONFIRMSWAP or TYPE=CONFIRMSPLIT statement must be followed by one or more MOUNT statements to identify the volumes whose progress is to be monitored. This FDRPAS job may be executed on any system that is involved in the swap of all of the volumes specified. However, you must not submit this confirm job until the SWAP or SWAPDUMP operation has been initiated for every volume identified on the MOUNT statements; if you submit the job before all volumes are active, it will fail.

As soon as all the volumes specified are synchronized, the monitor task will signal the swap task to complete the SWAP or SWAPDUMP of those volumes, all at once. If you submit this job before all of the volumes are ready to complete, it will wait for all the volumes to enter that state. If you submit the job after all the volumes are ready to complete, it will confirm the operation immediately (Note that, depending on update activity, a given volume may enter the "ready to complete" state and then exit that state for a few seconds; the monitor task will wait until all the volumes you specified are ready, which may take a few seconds to a few minutes).

Note that the default of CONFIRMSWAP=NO is recommended for a SWAP operation unless you have a specific reason for wanting a number of disk volumes to complete their swap at the same time.

OPERANDS

TYPE= Must be specified on the MONITOR Statement.

CONFIRMSWAP or CONFIRMSPLIT - initiates a monitor task which will monitor the operation of swap tasks for one or more volumes, and which will automatically confirm and complete the FDRPAS operation on those volumes when all the volumes are synchronized and ready to complete.

310.08 FDRPAS MONITOR CONFIRM MOUNT STATEMENT

MOUNT **VOL=**volser

MOUNT STATEMENT

The monitor MOUNT VOL= statement follows the MONITOR TYPE=CONFIRMSWAP or CONFIRMSPLIT statement and specifies a volume to be monitored until it is synchronized with its offline target device. You can specify multiple MOUNT statements, each specifying a volume to be monitored. When **all** volumes specified are synchronized, the monitor task will signal the swap task to confirm the swap and complete the SWAP or SWAPDUMP operation for all the volumes, at one time.

OPERANDS

VOL= Specifies the complete volume serial of one online volume to be monitored. A SWAP or SWAPDUMP of the volume must be in progress by an FDRPAS swap task.

310.09 FDRPAS HISTORY STATEMENT

```
HISTORY     TYPE=SWAP
            ,MAXSWAPHISTORY=nnn
            ,MAXSWAPHISTORYDAYS=nnnnn
```

HISTORY STATEMENT

This statement will cause FDRPAS to print the history records for the disk volumes specified by the MOUNT statements which follow, showing the date each volume was swapped and the source and target devices.

If MAXSWAPHISTORY= and/or MAXSWAPHISTORYDAYS= is specified, FDRPAS will automatically purge obsolete history records based on the number of times a volume has been swapped, or the number of days since the swap occurred. If both operands are omitted, then the HISTORY statement will only print history records and will not purge any records.

OPERANDS

TYPE=SWAP Must be specified on the HISTORY Statement.

MAXSWAPHISTORY= Specifies the maximum number of history records (1-255) to retain for each selected disk volume. History records in excess of this number will be purged (uncataloged). If a volume was swapped on multiple systems, it will retain this many records per system.

MAXSWAPHISTORY-DAYS= Specifies the maximum number of days (1-65535) to retain history records for each selected disk volume. History records created prior to the date calculated from this value will be purged (uncataloged).

310.10 FDRPAS HISTORY MOUNT STATEMENT

MOUNT **VOL=**volser

MOUNT STATEMENT

The history MOUNT VOL= statement follows the HISTORY TYPE=SWAP statement and specifies a volume serial or volume serial prefix for which history records are to be displayed and optionally purged. You can specify multiple MOUNT statements, each specifying a volume or group of volumes.

OPERANDS

VOL= Specifies a volume serial or volume serial prefix for volumes for which history records are to be processed. You can specify:

VOL=volser	A complete volume serial
VOL=vol*	A prefix, 1-5 characters followed by *
VOL=*	All volumes with FDRPAS history records

310.11 FDRPAS SWAPBUILDIX STATEMENT

SWAPBUILDIX TYPE=FULL

,#SYSTEMS=nnn

,LOGMESS=YES|NO

,MIN#SYSTEMS=nnnn

SWAPBUILDIX STATEMENT

This statement initiates an FDRPAS utility task to build or rebuild the indexed VTOC (VTOCIX) on an online volume. It must be the first statement in the input; only one SWAPBUILDIX statement is allowed per execution. SWAPBUILDIX must be followed by one or more MOUNT statements to identify the online volumes on which to build the VTOCIX and may optionally be followed by one or more EXCLUDE statements to exclude certain systems which do not have the volumes online; a maximum of 250 MOUNT/EXCLUDE statements may be present.

SWAPBUILDIX is equivalent to a BUILDIX function under the IBM utility ICKDSF; in fact, FDRPAS invokes ICKDSF to build the VTOCIX. However, ICKDSF requires that the volume be placed offline to all sharing systems except the one where the BUILDIX function is executed. FDRPAS allows you build the VTOCIX while the volume is still online to all sharing systems. Unlike ICKDSF, FDRPAS SWAPBUILDIX is easier to schedule and execute and does not disrupt normal usage of the volume.

The MOUNT and optional EXCLUDE statements which follow the SWAPBUILDIX statement are the same as those used with the SWAP and SWAPDUMP statements; they are described in Sections 310.03 and 310.04. On the MOUNT statement, the VOL= operand identifies the volume on which the VTOCIX is to be built, and the SWAPUNIT= operand identifies an offline monitor disk volume which FDRPAS will use to coordinate the BUILDIX between the systems. If you have multiple MOUNT statements in one SWAPBUILDIX step, they can use the same SWAPUNIT= value since they are executed serially. However, if you submit multiple SWAPBUILDIX jobs for concurrent execution, each one must use a unique offline SWAPUNIT= device.

Like FDRPAS SWAP and SWAPDUMP operations, the SWAPBUILDIX task executes on only one system in a multi-system environment. On the other systems, you must execute FDRPAS MONITOR tasks, exactly like the monitor tasks used with SWAP and SWAPDUMP. The monitor tasks must monitor the same offline monitor disk device(s) specified by SWAPUNIT= in the SWAPBUILDIX task. The considerations for running monitor tasks and the systems on which they must be executed are the same as for SWAP and SWAPDUMP and are discussed elsewhere in this manual.

The online volumes must contain a SYS1.VTOCIX.xxxxxxx data set before the SWAPBUILDIX begins; FDRPAS will not allocate the VTOCIX if it does not exist. The operation will fail if the VTOCIX data set is not present. The IBM ICKDSF manual contains information on allocating and sizing the VTOCIX.

If the VTOCIX is present but inactive on the volume, FDRPAS will invoke ICKDSF to build the VTOCIX, then the monitor tasks on the other systems will update their respective systems with the VTOCIX information. If the VTOCIX is already active, ICKDSF will not be invoked, but FDRPAS will insure that the VTOCIX information is correct on every system.

Note: there is a small chance that the VTOCIX will be disabled again as soon as FDRPAS enables it. This can occur if software on one system (such as IEHLIST or DFSMShsm) accesses the Format 4 DSCB in the VTOC (where the VTOCIX-active flag is stored) before FDRPAS can update the system control blocks to say that the VTOCIX is active. In this case, just run the SWAPBUILDIX again.

SWAPBUILDIX uses code and techniques normally used for a SWAPDUMP operation; you may notice that many FDRPAS messages will say "DUMP" when a SWAPBUILDIX is executed. SWAPBUILDIX will modify the offline monitor disk device, so you must be sure that that offline disk does not contain any data which must be preserved. If you want to bring the offline monitor disk online, you will need to reinitialize it with ICKDSF first.

A RACROUTE call will be issued to verify that the user has READ authority to resource FDRPAS.SWAPBUILDIX in the FACILITY class, if that resource is protected. If FDRPAS.SWAPBUILDIX is not protected, the operation will continue.

310.11 CONTINUED . . .

If you have security checking enabled (the ALLCALL option as shown in Section 380.04), SWAPBUILDIX checks that the user have at least ALTER authority to the source volser under the DASDVOL security class. If the user does not have DASDVOL authority, the operation will fail. . If the volume is not protected by DASDVOL, FDRPAS will check that the user has ALTER authority in the DATASET class to every data set on the volume; if any dataset is not authorized, the operation will fail.

If you have restricted the use of ICKDSF, then the FDRPAS SWAPBUILDIX job must be authorized to use it.

OPERANDS

TYPE=FULL Must be specified on the SWAPBUILDIX Statement.

#SYSTEMS= specifies the number of system images (CPUs or LPARs, 1 to 128) which will be involved in the SWAPBUILDIX of a disk on certain hardware. If the volume is in certain disk subsystems, #SYSTEMS= is required, on all others it is ignored.

If the volume is in an IBM 3990-3, IBM RVA, StorageTek SVA/V960, EMC Symmetrix 4xxx or any subsystem that emulates a 3990-3, you must specify #SYSTEMS=. If you omit #SYSTEMS= and FDRPAS is unable to determine the number of systems, it will terminate with a diagnostic message and you will need to resubmit the job with #SYSTEMS= specified. **It is extremely important that you specify #SYSTEMS= accurately.**

In the simplest case, if all of your systems have the volume in the I/O configuration, even if it is offline, then you should run a FDRPAS monitor task on each of those systems that is IPLed. Specify #SYSTEMS= equal to the number of monitor tasks. Remember that all those systems must also have the offline monitor device (SWAPUNIT=) in the I/O configuration.

If some of your systems have neither device in their configuration, those systems do not have to participate. If the rest of the systems have both the devices accessible, run monitor tasks on those systems and specify #SYSTEMS= equal to the number of monitor tasks.

If some of your systems do not have the online volume in the I/O configuration but do have the monitor device, then you should run a FDRPAS monitor task on every system that has the monitor device in the configuration (even those without the online volume) and specify #SYSTEMS= equal to the number of monitor tasks.

Here are some examples, assuming you have 5 systems:

1) if all 5 systems can access both devices, and all 5 are IPLed, run monitors on all 5 and specify #SYSTEMS=5.

2) if 2 of the systems are not running (not IPLed), run monitors on the remaining 3 and specify #SYSTEMS=3.

3) if 2 of the systems do not have the online device in their configuration, but all 5 have access to the monitor device, run monitors on all 5 and specify #SYSTEMS=5

4) if 3 of the systems have neither device in their configuration, run monitors on the remaining 2 and specify #SYSTEMS=2.

An FDRPAS monitor task must be executing, monitoring the offline monitor device, on each of those systems. If the expected number of systems (monitor tasks) do not indicate their participation within a time limit, FDRPAS will issue a FDRW68 WTOR to the system operator, who can allow the BUILDIX to continue with the lesser number of participating systems, to terminate the BUILDIX, or to wait an additional time for more systems to participate. You can also reply to this message from the FDRPAS ISPF panels.

310.11 CONTINUED . . .

LOGMESS= **YES** – messages will be written to SYSLOG (and usually to an operator console) documenting that the SWAPBUILDIX is occurring, and has completed.

NO – no SYSLOG/console messages are written.

Default: NO

MIN#SYSTEMS= specifies the minimum number of system images (CPUs or LPARs, 1 to 128) which must participate in the SWAPBUILDIX of the volumes in this step. MIN#SYSTEMS= can be used only when the online volume is in a disk subsystem where FDRPAS can determine from the hardware the number of systems which have access to the volumes (where the #SYSTEMS= operand is not required), but when you are certain that some of those systems do not have the volume online. For example, if the hardware reports that 10 systems can access the volumes but you are certain that 3 of those systems have both volumes offline, specify MIN#SYSTEMS=7 to allow the operation to proceed without operator intervention. **Innovation suggests that you use console commands or similar displays on each system to verify the number of systems which have the volume online.**

You can alternately use the EXCLUDE statement (see Section 310.04) to specify the CPUIDs of systems which do not have the volume online.

If you do not specify MIN#SYSTEMS= or EXCLUDE in this circumstance, FDRPAS will issue console WTOR message FDRW68 asking the operator to confirm that the operation should continue without the participation of the missing systems.

A FDRPAS monitor task must be running on each of the systems which will participate in the SWAPBUILDIX.

310.12 FDRPAS LICENSE STATEMENT

```
LICENSE     TYPE=SWAP
            ,PRINT=ALL
```

LICENSE STATEMENT

This statement will cause FDRPAS to quickly scan all of the disk storage online on the system where it is executed. It will list the disk subsystems it finds by manufacturer, serial number, and gigabytes (GB) of online storage in the subsystem. It also shows the equivalent number of 3390-3 volumes in each subsystem. The total GB and 3390-3 equivalents for the entire system are also shown.

If PRINT=ALL is specified, it will additionally report on every online disk volume, showing its device address, size in cylinders and size in GB. This report will be written to the TAPE1 DD statement, which will be dynamically allocated as SYSOUT=* if it is not present in the JCL.

If a disk subsystem is listed as type UNKNOWN, this means that FDRPAS was unable to determine the manufacturer and serial number of the subsystem; this can occur on IBM 3990-3 and older control units.

FDRPAS license charges may be based on the total online GB of data on your systems, so Innovation may ask you to run a LICENSE TYPE=SWAP on every system in order to determine these charges.

OPERANDS

TYPE=SWAP Must be specified on the LICENSE Statement.

PRINT=ALL FDRPAS will generate a report showing every individual online disk volume. If omitted, only the totals for each disk subsystem are printed.

310.20 FDRPAS LICENSE EXAMPLES

FDRPAS license charges may be based on the total online GB of data on your systems, so Innovation may ask you to run a LICENSE TYPE=SWAP on every system in order to determine these charges.

LICENSE REPORT

FDRPAS will display the amount of online storage in every disk subsystem attached to this system.

```
//LICENSE     EXEC   PGM=FDRPAS,REGION=0M
//STEPLIB      DD    DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD    SYSOUT=*
//SYSUDUMP     DD    SYSOUT=*
//SYSIN        DD    *
     LICENSE   TYPE=SWAP
```

This will produce an output similar to:

```
FDR303  CARD IMAGE --   LICENSE TYPE=SWAP,PRINT=ALL
CONTROLLER SSID STORGRP  UNIT VOLSER   % ALLOC  # CYLS  SIZE(GB)    TOTAL(GB)  # 3390-3
---------- ---- -------- ---- ------   -------  ------  --------  -----------  --------
 *UNKNOWN*                                 18                        28.647         10
 EMC 01336                                 56                        98.371         34
 IBM 14710                                 12                       225.302         79
 IBM 22935                                 18                       194.225         68
 IBM 70941                                 44                       117.933         41
 IBM 91468                                 24                        15.136          5
 EMC 00938                                 10                        48.458         17
 EMC 01889                                  4                       200.515         70
 HTC 45278                                 19                        63.764         22
 IBM 00000                                 84                         5.676          2
CPU SERIAL SYSTEM NAME                  % ALLOC                    TOTAL(GB)  # 3390-3
---------- -----------                  -------                  -----------  --------
```

LICENSE REPORT WITH VOLUME DETAIL

FDRPAS will display the amount of online storage in every disk subsystem attached to this system. Additionally, it will dynamically allocate a TAPE1 DD SYSOUT=* statement and write a report to it showing details of every online disk volume.

```
//LICENSE     EXEC   PGM=FDRPAS,REGION=0M
//STEPLIB      DD    DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD    SYSOUT=*
//SYSUDUMP     DD    SYSOUT=*
//SYSIN        DD    *
     LICENSE   TYPE=SWAP,PRINT=ALL
```

310.21 FDRPAS SWAP EXAMPLES

These are examples of SWAP operations, where the volumes involved will be moved to the new disk devices specified by the SWAPUNIT= operand.

SWAP A VOLUME ON A SINGLE SYSTEM

A volume accessible by a single system image will be swapped to a new device (the volume must be attached to a 3990-6 control unit or compatible disk subsystem; if not, #SYSTEMS=1 must be specified). The source volume **must not** be accessible by any other system image. The target device must be offline.

```
//SWAP      EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB    DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT   DD   SYSOUT=*
//SYSUDUMP   DD   SYSOUT=*
//SYSIN      DD   *
     SWAP     TYPE=FULL
     MOUNT    VOL=DATA22,SWAPUNIT=07C3
```

SWAP SEVERAL VOLUMES ON A SINGLE SYSTEM SERIALLY

Several volumes on adjacent MVS addresses on a single system image will be swapped to new devices on adjacent addresses (1AAx) in the new disk subsystem. The volumes **must not** be accessible by any other system image. The target devices must be offline. These volumes will be swapped one at a time, serially. #SYSTEMS=1 was specified because the source volumes were on a control unit (such as an IBM RVA) where FDRPAS cannot determine the number of systems with access to the volume.

```
//SWAP      EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB    DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT   DD   SYSOUT=*
//SYSUDUMP   DD   SYSOUT=*
//SYSIN      DD   *
     SWAP     TYPE=FULL,#SYSTEMS=1
     MOUNT    VOL=TSO001,SWAPUNIT=1AA*
     MOUNT    VOL=TSO002,SWAPUNIT=1AA*
     MOUNT    VOL=TSO003,SWAPUNIT=1AA*
     MOUNT    VOL=TSO004,SWAPUNIT=1AA*
     MOUNT    VOL=TSO005,SWAPUNIT=1AA*
```

SWAP SEVERAL VOLUMES ON A SINGLE SYSTEM CONCURRENTLY

Several volumes on adjacent MVS addresses on a single system image will be swapped to new devices on adjacent addresses (1AAx) in the new disk subsystem. The volumes must not be accessible by any other system image. The target devices must be offline. All 5 volumes will be swapped concurrently. #SYSTEMS=1 was specified because the source volumes were on a control unit (such as an IBM RVA) where FDRPAS cannot determine the number of systems with access to the volume.

```
//SWAP      EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB    DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT   DD   SYSOUT=*
//SYSUDUMP   DD   SYSOUT=*
//SYSIN      DD   *
     SWAP     TYPE=FULL,#SYSTEMS=1,MAXTASKS=5
     MOUNT    VOL=TSO001,SWAPUNIT=1AA*
     MOUNT    VOL=TSO002,SWAPUNIT=1AA*
     MOUNT    VOL=TSO003,SWAPUNIT=1AA*
     MOUNT    VOL=TSO004,SWAPUNIT=1AA*
     MOUNT    VOL=TSO005,SWAPUNIT=1AA*
```

310.21 CONTINUED . . .

SWAP A VOLUME ON MULTIPLE SYSTEMS

A volume accessible to multiple system images will be swapped to a new device. FDRPAS will determine the number of systems which have access to the volume (the volume must be attached to a 3990-6 control unit or compatible disk subsystem; if not, #SYSTEMS=n must be specified). Prior to running this job, you must start FDRPAS monitor tasks on each of the systems, to monitor the target device (see examples in Section 310.23). The target device must be offline on all systems.

```
//SWAP        EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
     SWAP      TYPE=FULL
     MOUNT     VOL=DATA22,SWAPUNIT=07C3
```

A partial output from the swap step will look similar to:

```
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=DATA22 TO UNIT=07C3 ON CPUB                          16.31.54
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=DATA22 TO UNIT=07C3 ON CPUA                          16.31.56
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=DATA22 TO UNIT=07C3 ON CPUC                          16.31.56
FDR007  ENDING   TIME OF FULL VOL SWAP -- 16.31.56 -- UNIT=3390-3 ,IN=D#DATA22,OUTPUT=TAPE1           16.31.56
FDR122  OPERATION STATISTICS FOR 3390 VOLUME.................DATA22                                     16.31.56
FDR122                       CYLINDERS ON VOLUME.............3,339                                    16.31.56
FDR122                       DATASETS PROCESSED..............234                                      16.31.56
FDR122                       BYTES READ FROM DASD.......237,893,477                                  16.31.56
FDR122                       DASD TRACKS SWAPPED.............4,986                                    16.31.56
FDR122                       UPDATED TRACKS RECOPIED.........2,639                                    16.31.56
FDR122                       DASD EXCPS......................381                                      16.31.56
FDR122                       TARGET DASD EXCPS...............450                                      16.31.56
FDR122                       CPU TIME (SECONDS)..............0.522                                    16.31.56
FDR122                       ELAPSED TIME (MINUTES)..........2.5                                      16.31.56
FDR122                       SWAP TIME.......................2.5                                      16.31.56
FDR999   FDR SUCCESSFULLY COMPLETED                                                                  16.31.56
```

DASD TRACKS SWAPPED is the total number of tracks that had to be copied during the swap, including tracks that were copied more than once because of updates during the swap.

UPDATED TRACKS RECOPIED is the number of tracks that had to be copied more than once because they were updated during the swap.

VERIFYING VOLUME INTEGRITY

If you are licensed for COMPAKTOR and FDRABR or FDREPORT or you have an FDRPAS trial tape which will contain all FDR products, you may want to run the steps shown to verify that there are no structural errors in the VTOC and VVDS on a volume before it is swapped.

```
//MAP         EXEC  PGM=FDRCPK,REGION=0M
//SYSPRINT     DD   SYSOUT=*
//SYSMAP       DD   SYSOUT=*
//SYSIN        DD    *
     MAP       VOL=DATA22,MAPS=SUMMARY
//DIAG        EXEC  PGM=FDREPORT,REGION=0M
//SYSPRINT     DD   SYSOUT=*
//SYSIN        DD    *
   SELECT      VOL=DATA22
   PRINT       ENABLE=DIAGNOSEVVDS
```

Note that VOL= may specify a specific volume serial (VOL=DATA22), a volser prefix (VOL=DATA*) or can select all online volumes (VOL=*). Since these checks take very little time per volume, VOL=* may be useful to quickly check volume integrity across the installation before starting the swaps.

310.21 CONTINUED . . .

SWAP SEVERAL VOLUMES ON MULTIPLE SYSTEMS CONCUR-RENTLY

Several volumes on adjacent MVS addresses which are accessible to 3 OS/390 system images will be swapped to new devices on adjacent addresses (1AAx) in the new disk subsystem. Prior to running these swaps, you must start an FDRPAS monitor task on each of the systems to monitor the target devices (see examples in section 310.23). The first example shows the use of the PASPROC cataloged procedure to start the SWAP operation by a START (S) command on the console. These will run as system started tasks instead of jobs. Issue the commands shown on an appropriate console on the proper system. The target devices must be offline on all systems. Since only a single MOUNT statement can be specified when starting a system started task, a separate task is used for each volume.

```
S PASPROC.TS0001,PARM='SWAP TYPE=FULL/MOUNT VOL=TS0001,SU=1AA**'
S PASPROC.TS0002,PARM='SWAP TYPE=FULL/MOUNT VOL=TS0002,SU=1AA**'
S PASPROC.TS0003,PARM='SWAP TYPE=FULL/MOUNT VOL=TS0003,SU=1AA**'
S PASPROC.TS0004,PARM='SWAP TYPE=FULL/MOUNT VOL=TS0004,SU=1AA**'
S PASPROC.TS0005,PARM='SWAP TYPE=FULL/MOUNT VOL=TS0005,SU=1AA**'
```

This is an alternate way of accomplishing the same swaps, by submitting a single batch job using PASPROC. Up to 10 volumes will be swapped concurrently by this one job, since MAXTASKS= is specified.

```
//SWAP        EXEC  PASPROC
//SYSIN        DD   *
     SWAP     TYPE=FULL,MAXTASKS=10
     MOUNT    VOL=TS0001,SWAPUNIT=1A**
     MOUNT    VOL=TS0002,SWAPUNIT=1A**
     MOUNT    VOL=TS0003,SWAPUNIT=1A**
     MOUNT    VOL=TS0004,SWAPUNIT=1A**
     MOUNT    VOL=TS0005,SWAPUNIT=1A**
       .  .  .
     MOUNT    VOL=TS0099,SWAPUNIT=1A**
```

SIMULATE A SWAP

Execute a simulated swap (SIMSWAP statement) to validate the parameters you will use for the real SWAP. No monitor tasks are required. On disk subsystems where FDRPAS can identify the attached systems, this will also display all of the systems with access to the source volumes specified.

```
//SIMSWAP     EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
     SIMSWAP  TYPE=FULL,MAXTASKS=3,LARGERSIZE=OK
     MOUNT    VOL=DATA22,SWAPUNIT=07C3
     MOUNT    VOL=PROD12,SWAPUNIT=425C
     MOUNT    VOL=TS0123,SWAPUNIT=A340
```

310.22 FDRPAS SWAPDUMP EXAMPLES

These are examples of SWAPDUMP operations, which create a point-in-time image of a online volume. The point-in-time image can then be backed up with FDRINSTANT (or possibly by other backup software).

POINT-IN-TIME BACKUP OF A VOLUME ON A SINGLE SYSTEM

A volume accessible by a single system image will be copied to an offline device. (the volume must be attached to a 3990-6 control unit or compatible disk subsystem; if not, #SYSTEMS=1 must be specified). The volume **must not** be accessible by any other system image. As soon as FDRPAS finishes synchronizing the volumes, the target device will become a frozen image of the source volume, at the point-in-time that FDRPAS finished. The second step uses FDRINSTANT to backup that point-in-time image; the special data set name of FDR.USE.UNIT07C3 on the DISK1 DD statement tells FDRINSTANT to backup the offline image on device 07C3.

```
//SWAPDUMP    EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
//SYSIN        DD   *
     SWAPDUMP TYPE=FULL
     MOUNT    VOL=DATA22,SWAPUNIT=07C3
//BACKUP      EXEC PGM=FDR,REGION=0M,COND=(0,NE,SWAPDUMP)
//SYSPRINT     DD   SYSOUT=*
//DISK1        DD   DSN=FDR.USE.UNIT07C3,UNIT=SYSALLDA,
//            VOL=SER=DATA22,DISP=OLD
//TAPE1        DD   DSN=BACKUP.VDATA22,UNIT=TAPE,DISP=(,CATLG)
//SYSIN        DD   *
     DUMP     TYPE=FDR
```

POINT-IN-TIME BACKUP OF SEVERAL VOLUMES ON MULTIPLE SYSTEMS CONCURRENTLY

Several volumes which are accessible to 3 system images will be copied to offline devices. Prior to running these swaps, you must start an FDRPAS monitor task on each of the systems to monitor the target devices. The first example shows the use of the PASPROC cataloged procedure to start the SWAPDUMP operation by a START (S) command on the console. These will run as system started tasks instead of jobs. Issue the commands shown on an appropriate console on the proper system. Note that CO= is an abbreviation for CONFIRMSPLIT= and SU= is an abbreviation for SWAPUNIT=, to reduce the length of the console input.

Because of the CONFIRMSPLIT=YES, FDRPAS will wait for confirmation before freezing the point-in-time image. You can confirm the swap using the FDRPAS ISPF panels, or by using a MONITOR TYPE=CONFIRMSPLIT job as shown in Section 310.24. Note that CONFIRMSPLIT=YES does not involve a WTOR to the console operator. Once the SWAPDUMP operations have been confirmed, you can use a product such as FDRINSTANT to backup those frozen images to tape.

```
S PASPROC.PROD01,PARM='SWAPDUMP TYPE=FULL,CO=YES/MOUNT VOL=PROD01,SU=1B32'
S PASPROC.PROD02,PARM='SWAPDUMP TYPE=FULL,CO=YES/MOUNT VOL=PROD02,SU=1B34'
S PASPROC.PROD03,PARM='SWAPDUMP TYPE=FULL,CO=YES/MOUNT VOL=PROD03,SU=1B37'
```

This is an alternate way of accomplishing the same SWAPDUMPs, by submitting a single batch job using PASPROC. All 3 volumes will be copied concurrently by this one job, since MAXTASKS= is specified. You can add additional MOUNT statements to do more volumes concurrently.

```
//SWAP        EXEC  PASPROC
//SYSIN        DD   *
     SWAPDUMP TYPE=FULL,MAXTASKS=20,CONFIRMSPLIT=YES
     MOUNT    VOL=PROD01,SWAPUNIT=1B32
     MOUNT    VOL=PROD02,SWAPUNIT=1B32
     MOUNT    VOL=PROD03,SWAPUNIT=1B37
```

310.23 FDRPAS MONITOR SWAP EXAMPLES

Note: if the source volume is accessible to multiple systems, even if it is offline on some of those systems, a FDRPAS monitor task, as shown in the following examples, must be started on **every** one of those systems before a FDRPAS SWAP, SWAPDUMP or SWAPBUILDIX task is started. If the source volume is in an EMC Symmetrix subsystem (except 4xxx systems), the monitor tasks need to be started only on systems where the source volume is online. On other disk subsystem types, the monitor tasks must execute on all systems with access to the source volume, even if it is offline.

The monitor tasks shown below are used with SWAP, SWAPDUMP and SWAPBUILDIX operations. Although the text below refers to "swap tasks" the examples will work with all 3 functions.

MONITOR A SINGLE TARGET DEVICE

Monitor offline device 1AA3 as a FDRPAS target device. FDRPAS will periodically check this device to see if an FDRPAS swap task has started on another OS/390 system image which is using the device as a target. If so, the monitor task will assist the swap task by monitoring this system image for updates to the original volume during the copy process, and by switching all I/O activity to the new device when the swap is complete.

This type of monitor task will automatically terminate once the swap has completed to the target device.

```
//MONITOR     EXEC  PASPROC
//SYSIN        DD   *
     MONITOR  TYPE=SWAP
     MOUNT    SWAPUNIT=1AA3
```

MONITOR A RANGE OF TARGET DEVICES

Monitor range 24E0-24EF of offline potential FDRPAS target devices (any devices in the range which are not offline or are not disk are ignored). FDRPAS will periodically check each of those devices to see if an FDRPAS swap task has started on another system image which is using the device as a target. If so, it will start a separate monitor task to assist the swap task by monitoring this system image for updates to the original volume during the copy process, and by switching all I/O activity to the new device when the swap is complete. Once all swaps on this range of offline devices has been completed, you may have to cancel the monitor started task with console command "C MON2". However, if every offline device in the range is now online (completed SWAP), the monitor task will terminate automatically.

```
S PASPROC.MON2,PARM='MONITOR TYPE=SWAP/MOUNT SU=24E*'
```

If your systems are part of a sysplex (basic or parallel), you can use the console ROUTE command to start monitor tasks on all systems in the sysplex. This can considerably reduce the amount of typing required. For example:

```
ROUTE T=0,*OTHER,S PASPROC.MON2,PARM='MONITOR TYPE=SWAP/MOUNT SU=24E*'
```

will start the monitor task on all other systems in the sysplex (*OTHER assumes that you will start the swap task on this system, use *ALL to start the monitor task on all systems).

If you have systems which are not part of the sysplex, you will have to manually start the monitor task on each of them.

310.23 CONTINUED . . .

MONITOR A RANGE OF TARGET DEVICES

Monitor ranges (1A00-1AFF and 1B00-1BFF) of offline potential FDRPAS target devices (any devices in the range which are not offline or not disk are ignored). FDRPAS will periodically check each of those devices to see if an FDRPAS swap task has started on another system image which is using the device as a target. If so, it will start a separate monitor task to assist the swap task by monitoring this system image for updates to the original volume during the copy process, and by switching all I/O activity to the new device when the swap is complete. As long as no more than 64 concurrent swaps are occurring on the monitored devices, all the separate monitor tasks will be internal subtasks. The monitor task will automatically terminate when it has been idle (not participating in any swaps) for a total of 2 hours (120 minutes).

Note: this monitor task needs to be started on **every** system which has access to the volumes to be swapped before the swap task is started.

```
//MONITOR     EXEC   PGM=FDRPAS,REGION=0M
//STEPLIB      DD    DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD    SYSOUT=*
//SYSUDUMP     DD    SYSOUT=*
//SYSIN        DD    *
     MONITOR   TYPE=SWAP,DURATION=120
     MOUNT     SWAPUNIT=(1A*,1B*)
```

MONITOR ALL POTENTIAL TARGET DEVICES

Monitor all offline potential FDRPAS target devices. FDRPAS will periodically check each of those devices to see if an FDRPAS swap task has started on another system image which is using the device as a target. If so, it will start a separate internal or external monitor task (the first 64 are internal) to assist the swap task by monitoring this system image for updates to the original volume during the copy process, and by switching all I/O activity to the new device when the swap is complete.

Note: this monitor task needs to be started on **every** system which has access to the volumes to be swapped before the swap task is started.

Warning: if you have many offline disk devices which are not FDRPAS targets, this job may cause unnecessary overhead.

```
//MONITOR     EXEC   PGM=FDRPAS,REGION=0M
//STEPLIB      DD    DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD    SYSOUT=*
//SYSUDUMP     DD    SYSOUT=*
//SYSIN        DD    *
     MONITOR   TYPE=SWAP, DURATION=120
     MOUNT     SWAPUNIT=*
```

Note: if the monitor task includes devices which are in your I/O configuration but which do not really exist (are not in the hardware configuration of the disk subsystem), you may receive this console message

IOS002A dev, NO PATHS AVAILABLE

for each such device the first time that the monitor task is executed after an IPL. The messages can be ignored. They may occur only under certain releases of OS/390.

310.24 FDRPAS MONITOR CONFIRM EXAMPLES

CONFIRM THE SWAP OF A SET OF VOLUMES

FDRPAS swap tasks are currently swapping volumes TSO001 to TSO005 and they specified CONFIRMSWAP=YES, so they will wait for a confirmation after the volumes are synchronized. The following job will cause an automatic confirmation of the swap. If it is submitted before the volumes are synchronized, it will wait for them to all become synchronized, then it will complete the swap of all 3 volumes, at one time. If the volumes are already synchronized when it is submitted, it will complete the swaps immediately.

Note: CONFIRMSWAP=YES is not recommended unless you have some real need to cause the swaps to complete all at the same time. Usually, it is better to let each swap complete automatically as soon as the devices are synchronized.

```
//CONFIRM    EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB     DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT    DD   SYSOUT=*
//SYSUDUMP    DD   SYSOUT=*
//SYSIN       DD   *
     MONITOR  TYPE=CONFIRMSWAP
     MOUNT    VOL=TSO001
     MOUNT    VOL=TSO002
     MOUNT    VOL=TSO003
     MOUNT    VOL=TSO004
     MOUNT    VOL=TSO005
```

CONFIRM THE SWAPDUMP OF A SET OF VOLUMES

FDRPAS swap tasks are currently creating point-in-time backups (SWAPDUMP) of volumes PROD01, PROD02 and PROD03 and they specified CONFIRMSPLIT=YES, so they will wait for a confirmation after the volumes are synchronized (see the last example in Section 310.22). The following job will cause an automatic confirmation of the operation. If it is submitted before the volumes are synchronized, it will wait for them to all become synchronized, then it will complete the creation of the point-in-time backups of all 3 volumes, at one time. If the volumes are already synchronized when it is submitted, it will complete the point-in-time backups immediately. The following step executes FDRINSTANT to create tape backups of the point-in-time backups; the special data set name of FDR.USE.UNITuuuu on the DISKx DD statements tells FDRINSTANT to backup the offline image on device "uuuu".

```
//CONFIRM    EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB     DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT    DD   SYSOUT=*
//SYSUDUMP    DD   SYSOUT=*
//SYSIN       DD   *
     MONITOR  TYPE=CONFIRMSPLIT
     MOUNT    VOL=PROD01
     MOUNT    VOL=PROD02
     MOUNT    VOL=PROD03
//BACKUP      EXEC PGM=FDR,REGION=0M,COND=(0,NE,CONFIRM)
//SYSPRINT    DD   SYSOUT=*
//SYSPRIN1    DD   SYSOUT=*
//SYSPRIN2    DD   SYSOUT=*
//SYSPRIN3    DD   SYSOUT=*
//DISK1       DD   DSN=FDR.USE.UNIT1B32,UNIT=SYSALLDA,
//               VOL=SER=PROD01,DISP=OLD
//TAPE1       DD   DSN=BACKUP.VPROD01,UNIT=TAPE,DISP=(,CATLG)
//DISK2       DD   DSN=FDR.USE.UNIT1B34,UNIT=SYSALLDA,
//               VOL=SER=PROD02,DISP=OLD
//TAPE2       DD   DSN=BACKUP.VPROD02,UNIT=TAPE,DISP=(,CATLG)
//DISK3       DD   DSN=FDR.USE.UNIT1B37,UNIT=SYSALLDA,
//               VOL=SER=PROD03,DISP=OLD
//TAPE3       DD   DSN=BACKUP.VPROD03,UNIT=TAPE,DISP=(,CATLG)
     DUMP  TYPE=FDR,ATTACH
```

310.25 FDRPAS HISTORY EXAMPLES

DISPLAY HISTORY FOR A SET OF VOLUMES

FDRPAS will display swap history records for all volumes beginning with PROD or DB.

```
//HISTORY     EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
//SYSIN        DD   *
     HISTORY  TYPE=SWAP
     MOUNT    VOL=PROD*
     MOUNT    VOL=DB*
```

DISPLAY AND PURGE HISTORY FOR ALL VOLUMES

FDRPAS will display swap history records for all volumes which FDRPAS has swapped. It will also purge history records which are older than 30 days.

```
//HISTORY     EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
//SYSIN        DD   *
     HISTORY  TYPE=SWAP,MAXSWAPHISTORYDAYS=30
     MOUNT    VOL=*
```

310.26 FDRPAS SWAPBUILDIX EXAMPLES

ADD A VTOCIX TO A VOLUME

An Indexed VTOC will be allocated and built on a volume which does not currently have a VTOCIX. FDRPAS will determine the number of systems which have access to the volume (the volume must be attached to a 3990-6 control unit or compatible disk subsystem; if not, #SYSTEMS=n must be specified). Prior to running this job, you must start FDRPAS monitor tasks on each of the systems, to monitor the offline monitor device specified by SWAPUNIT= (see example below). The monitor device must be offline on all systems.

```
//BUILDIX     EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
//VTOCIX       DD   DSN=SYS1.VTOCIX.DATA22,UNIT=SYSALLDA,
//          VOL=SER=DATA22,DISP=(,KEEP),SPACE=(TRK,5)  (see note)
     SWAPBUILDIX  TYPE=FULL
     MOUNT     VOL=DATA22,SWAPUNIT=07C3
```

Note: Consult the IBM ICKDSF manual for information on allocating and sizing VTOCIX data sets.

REBUILD THE VTOCIX ON THREE VOLUMES

The disabled Indexed VTOC will be rebuilt on 3 volumes. FDRPAS will determine the number of systems which have access to each volume (the volume must be attached to a 3990-6 control unit or compatible disk subsystem; if not, #SYSTEMS=n must be specified). Prior to running this job, you must start FDRPAS monitor tasks on each of the systems, to monitor the offline monitor device specified by SWAPUNIT= (see example below). The monitor device must be offline on all systems.

```
//BUILDIX     EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT     DD   SYSOUT=*
//SYSUDUMP     DD   SYSOUT=*
     SWAPBUILDIX  TYPE=FULL
     MOUNT     VOL=DATA23,SWAPUNIT=07C3
     MOUNT     VOL=DATA24,SWAPUNIT=07C3
     MOUNT     VOL=DATA25,SWAPUNIT=07C3
```

MONITOR THE SWAPBUILDIX MONITOR DEVICE

Monitor offline device 07C3 for SWAPBUILDIX operations; this is actually the same as monitor tasks used with other FDRPAS operations. FDRPAS will periodically check this device to see if an FDRPAS SWAPBUILDIX task has started on another system. If so, the monitor task will wait for the VTOCIX to be rebuilt and then update the VTOCIX information on this system.

Since this type of monitor task will continue to look for SWAPBUILDIX operations until terminated, you will probably want to use the DURATION= operand to automatically terminate it when it has been idle for a number of minutes. Alternately you can cancel it when you are done.

```
//MONITOR     EXEC  PASPROC
//SYSIN        DD   *
     MONITOR  TYPE=SWAP,DURATION=10
     MOUNT    SWAPUNIT=07C3
```

310.30 FDRPAS SAMPLE PRINTOUTS

SAMPLE SWAP TASK PRINTOUT

```
FDR001  FDR PLUG AND SWAP     - FDRPAS  VER. 5.4/15P  - INNOVATION DATA PROCESSING         DATE=2001.004  PAGE   1

FDR303  CARD IMAGE --   SWAP TYPE=FULL                                        00080004
FDR303  CARD IMAGE --   MOUNT VOL=TSO010,SWAPUNIT=226F                                  00090013         10.17.53

FDR233  SYSA  (SERIAL# 0109419672) ACKNOWLEDGES THE SWAP OF VOL=TSO010                                   10.17.53
FDR233  SYSC  (SERIAL# 0132429672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSJ  (SERIAL# 0209419672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSZ  (SERIAL# 0054502064) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSE  (SERIAL# 0309419672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSD  (SERIAL# 0146279672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AMD HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSH  (SERIAL# 0270039672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSI  (SERIAL# 0032429672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSB  (SERIAL# 0145399672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDR233  SYSK  (SERIAL# 0432429672) ACKNOWLEDGES THE SWAP OF VOL=TSO010 AND HAS JOINED IN SWAP OF UNIT=2121 TO 226F
FDRW66  SWAP OF VOL=TSO010 TO UNIT=226F STARTED ON  10 SYSTEMS (SYSA SYSC SYSJ SYSZ SYSE SYSD SYSH SYSI SYSB SYSK)

FDR236  SYSA  ACTIVATED I/O INTERCEPTS ON UNIT=2121                                                     10.17.59
FDR007  STARTING TIME OF FULL VOL SWAP -- 10.17.59 -- UNIT=3390  ,IN=D#TSO010,OUTPUT=TAPE1              10.17.59
FDR158  DATA SET IS ACTIVE  DSN=TSO.USER.TEST                                                           10.17.59
FDR239      106 TRACKS UPDATED BY SYSA                                                                  10.24.18
FDR239        8 TRACKS UPDATED BY SYSJ                                                                  10.24.18
FDR239        7 TRACKS UPDATED BY SYSH                                                                  10.24.18
FDR239      109 TOTAL UNIQUE TRACKS UPDATED IN PASS     1 - RE-COPYING UPDATED TRACKS                   10.24.18
FDR236  SYSA  DE-ACTIVATED I/O INTERCEPTS ON UNIT=2121       106 TRACKS UPDATED                         10.24.19

FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSA                           10.24.20
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSC                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSJ                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSZ                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSE                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSD                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSH                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSI                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSB                           10.24.23
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=TSO010 TO UNIT=226F ON SYSK                           10.24.23
FDR007  ENDING   TIME OF FULL VOL SWAP -- 10.24.24 -- UNIT=3390 ,IN=D#TSO010,OUTPUT=TAPE1              10.24.24
FDR122  OPERATION STATISTICS FOR 3390 VOLUME.................TSO010                                      10.24.24
FDR122                       CYLINDERS ON VOLUME.............3,339                                      10.24.24
FDR122                       DATASETS PROCESSED..............274                                        10.24.24
FDR122                       BYTES READ FROM DASD.....1,467,108,993                                    10.24.24
FDR122                       DASD TRACKS SWAPPED.............29,098                                     10.24.24
FDR122                       UPDATED TRACKS RECOPIED...........109                                     10.24.24
FDR122                       DASD EXCPS.....................1,991                                      10.24.24
FDR122                       TARGET DASD EXCPS..............2,080                                      10.24.24
FDR122                       CPU TIME (SECONDS).............2.297                                      10.24.24
FDR122                       ELAPSED TIME (MINUTES).............6.5                                    10.24.24
FDR122                       SWAP TIME.........................6.3                                      10.24.24
FDR999   FDR SUCCESSFULLY COMPLETED                                                                    10.24.24
```

In this sample printout above from an FDRPAS swap task, you can see:

- the control statements, requesting the swap
- monitor tasks on 10 additional systems joining in the swap (Phase 1)
- I/O intercepts installed on all 11 systems (Phase 2)
- Active data sets are identified (note that since SYSDSN ENQs are not specific by volser, if you are swapping a volume containing uncataloged copies of data sets that are active on another volume, FDRPAS may identify them as active on this volume).
- The initial copy of active data tracks (Phase 3, pass 1)
- Final copying of updated tracks (Phase 4 and Phase 3, pass 2)
- Swap completed (Phase 5)
- Statistics about the swap

310.30 CONTINUED . . .

SAMPLE SWAP MONITOR OUTPUT

```
FDR001  FDR PLUG AND SWAP           - FDRPAS  VER. 5.4/15P  - INNOVATION DATA PROCESSING        DATE=2000.296  PAGE   1
FDR303  CARD IMAGE --  MONITOR TYPE=SWAP,DURATION=120
FDR303  CARD IMAGE --  MOUNT SWAPUNIT=21C*                                                                    13.06.58
FDR235 FDRPAS ON CPU SERIAL# 0432429672 IS MONITORING THE FOLLOWING 16 UNITS:                                      13.06.59
FDR235   21C0 21C1 21C2 21C3 21C4 21C5 21C6 21C7 21C8 21C9 21CA 21CB 21CC 21CD 21CE 21CF                      13.06.59

FDR238   FDRPAS STARTED MONITOR JOIN TASK FOR UNIT=21C2                                                       13.06.59
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=RVA7D2 TO UNIT=21C2 ON CPUB                                  13.07.52

FDR238   FDRPAS STARTED MONITOR JOIN TASK FOR UNIT=21C1                                                       13.15.49
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=RVA7D1 TO UNIT=21C1 ON CPUB                                  13.18.42

FDR238   FDRPAS STARTED MONITOR JOIN TASK FOR UNIT=21C7                                                       13.15.49
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=RVA7D7 TO UNIT=21C7 ON CPUB                                  13.18.42
FDR999   FDR SUCCESSFULLY COMPLETED                                                                          15.06.59
```

In this sample printout above from a user-submitted FDRPAS monitor task, you can see:

- the control statements, requesting that FDRPAS monitor a range of target device, waiting for swaps to begin.
- The monitor task detected swaps beginning on 4 target devices, at different times.
- 3 swaps completed successfully on this system.
- the monitor task terminated automatically after 2 hours (DURATION=120).

```
FDR001  FDR PLUG AND SWAP           - FDRPAS  VER. 5.4/15P  - INNOVATION DATA PROCESSING        DATE=2000.296  PAGE   1
FDR303  CARD IMAGE -- MONITOR TYPE=JOIN,NOS/MOUNT SU=21C1                                                  PARM ENTRY
FDR303  CARD IMAGE -- MOUNT SU=21C1                                                                  ,,    PARM ENTRY
FDR235  FDRPAS ON CPU SERIAL# 0432429672 IS MONITORING THE FOLLOWING 1 UNIT:                                   13.15.49
FDR235   21C1                                                                                                  13.15.49
FDR233  CPUB     (SERIAL# 0209417060) ACKNOWLEDGES THE SWAP OF VOL=RVA7D1 AND HAS JOINED IN SWAP OF UNIT=07D1 TO 21C1
FDR236  CPUB     ACTIVATED I/O INTERCEPTS ON UNIT=07D1                                                          13.16.33
FDR236  CPUB     DE-ACTIVATED I/O INTERCEPTS ON UNIT=07D1       252 TRACKS UPDATED                              13.18.36
FDR241  FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=RVA7D1 TO UNIT=21C1 ON CPUB                                  13.18.36
FDR999   FDR SUCCESSFULLY COMPLETED                                                                           13.18.41
```

In this sample printout above from an internally-started FDRPAS monitor task, you can see:

- the control statements, requesting that FDRPAS join a swap that was detected by the user-submitted monitor task.
- The swap beginning on another system and this system joining in the swap (Phase 1)
- I/O intercept installed on this system (Phase 2)
- I/O intercept de-installed on this system (Phase 4). While active, it detected that 252 tracks on the source volume were updated on this system.
- Swap completed (Phase 5)

The output from a user-submitted monitor task which monitors only a single target device will be similar to this example.

310.31 FDRPAS ISPF INTERFACE

The FDRPAS ISPF interface allows you to initiate, monitor and control FDRPAS operations on the system to which your TSO session is logged on. You can:

- monitor active swaps
- initiate SWAP and SWAPDUMP tasks
- confirm swaps that specified CONFIRMSWAP=YES or CONFIRMSPLIT=YES
- suspend and resume active swaps
- terminate active swaps
- reply to certain FDRPAS console messages
- display FDRPAS history records
- display basic information about any disk devices in your installation, selecting them by unit address, volser, subsystem ID, subsystem serial number, or SMS storage group.

INVOKING THE FDRPAS ISPF DIALOGS

The FDRPAS ISPF dialogs are integrated with the ISPF dialogs of FDR, the Innovation Data Processing FDR disk management system. If you have installed the FDR ISPF dialogs at a release level matching the level of FDRPAS that you are using, your FDR or ABR main ISPF menu will have an option P for FDRPAS. If so, you can skip the invocation of ABRALLOC shown below and use that option to invoke the FDRPAS dialogs.

If you don't have an appropriate level of the FDR dialogs installed, or they are at a lower release level than the level of FDRPAS in use, then use the following procedure:

Go to ISPF option 6, or exit ISPF to TSO READY mode, and issue this command:

```
EXEC 'fdrpas.clist.library(ABRALLOC)'
```

specifying the name of the FDRPAS CLIST library that was installed during the installation of FDRPAS (Section 380). This will allocate all of the required FDRPAS ISPF libraries and invoke the ABR dialogs (including FDRPAS).

If you issued the ABRALLOC from TSO READY, you will see a standard ISPF main menu with an additional option A (for ABR). If your installation has modified your ISPF main menu, this may look considerably different than you are normally used to seeing. This ISPF menu will look something like this:

```
  Menu  Utilities  Compilers  Options  Status  Help
--------------------------------------------------------------------------------
                           ISPF Primary Option Menu
Option ===> A

0  Settings      Terminal and user parameters          User ID . : DF
1  View          Display source data or listings       Time. . . : 09:05
2  Edit          Create or change source data          Terminal. : 3278
3  Utilities     Perform utility functions             Screen. . : 1
4  Foreground    Interactive language processing       Language. : ENGLISH
5  Batch         Submit job for language processing    Appl ID . : ISR
6  Command       Enter TSO or Workstation commands     TSO logon : V48ISPF
7  Dialog Test   Perform dialog testing                TSO prefix: DF
8  LM Facility   Library administrator functions       System ID : OS24
9  IBM Products  IBM program development products      MVS acct. : **NONE**
10 SCLM          SW Configuration Library Manager      Release . : ISPF 4.8
11 Workplace     ISPF Object/Action Workplace
A  FDR/ABR       FDR/ABR DASD Management Functions
```

Select option A on the Option line, as shown and press ENTER to display the FDR/ABR primary options menu.

310.31 CONTINUED . . .

FDR/ABR PRIMARY OPTIONS MENU

The FDR/ABR primary options menu will look like this:

```
---------- FDR TOTAL DASD MANAGEMENT SYSTEM -- FDR PRIMARY OPTIONS MENU ------
OPTION  ===> P

   1  REPORTS     - ABR REPORTING FUNCTIONS
   2  RESTORE     - ABR DATA SET RESTORE
   3  ARCHIVE     - ABR DATA SET ARCHIVE OR SUPERSCRATCH
   4  BACKUP      - ABR DATA SET BACKUP
   5  REMOTE Q    - ABR REMOTE QUEUE UTILITY FUNCTIONS

   C  COMPAKTOR   - COMPAKTOR MAP AND SIMULATION REPORTS
   R  RELEASE     - COMPAKTOR RELEASE

   I  INSTALL     - INSTALLATION AND MAINTENANCE OF FDR AND OPTIONAL PRODUCTS
   J  JCL PARMS   - SPECIFY FDR JCL AND SYSOUT DEFAULTS FOR SUBMITTED JOBS
   K  FORMAT      - MODIFY FORMAT OF GENERATED REPORTS

   M  MESSAGES    - FDR MESSAGES AND CODES QUERY FACILITY
   P  PLUG & SWAP - FDRPAS PLUG & SWAP
   Q  QUERY       - FDR/ABR STATISTICS QUERY

   S  SRS         - SEARCH, REPORT, SERVICES DIALOG

   T  FDRTSEL     - BACKUP FILE MANAGEMENT UTILITY
```

Select option P to monitor and control FDRPAS. Other options are used for FDRABR and other components of the FDR DASD management software. Option **I** is used during installation of FDRPAS as described in Section 380.

310.31 CONTINUED . . .

FDRPAS PANEL This panel is displayed by the P option. It is used to initiate, monitor and control FDRPAS sessions

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                  SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                              Panel: 1 of 9
Command  Volume  Unit  Swap to                                 REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ------------------------------------------------
'''
         Pass:         % Tracks to copy:        Copied:        Updated:
         Source - Reserve:     Level:     Pace:     Type:         Cyls:
         Target - Reserve:     Level:     Pace:     Type:         Cyls:
         Storgrp:          SSID:       CU Serial#:
```

If you simply press ENTER, it checks to see if there are any swaps in progress on this system. If active swaps were found, they are automatically displayed, such as:

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                  SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                              Panel: 1 of 9
Command  Volume  Unit  Swap to                                 REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ------------------------------------------------
         TSO001  07C1   2C31     ACTIVE
         Pass: 1    75 % Tracks to copy: 9554   Copied: 7245   Updated: 1091
         Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Storgrp:          SSID: 0310  CU Serial#: 14710

         SMS123  07C2   2C32     ACTIVE
         Pass: 3    95 % Tracks to copy: 1000   Copied:  950   Updated: 0
         Source - Reserve:   0 Level:   1 Pace: 0   Type: 3390-3  Cyls: 3339
         Target - Reserve:   1 Level:   1 Pace: 5:  Type: 3390-3  Cyls: 3339
         Storgrp: SGWORK   SSID: 0311  CU Serial#: 14710
```

You have several options:

- As long as there are no volumes displayed on the screen, you can simply press ENTER to display any FDRPAS swaps which are active on this system (either swap tasks or monitor tasks).
- You can also request that volumes which are not currently involved in a swap be added to the display; this can be useful to initiate swaps or to verify the current location of selected volumes. Details are later in this section.
- If there are already volumes displayed, enter the "Active" command (or just A) on the Command line to add any additional active swaps to the display.
- If the display currently contains at least one volume which was added to the display because it was active (by pressing ENTER on a empty screen or by entering the Active command), then pressing ENTER again will scan for active volumes again and add any newly active swaps to the display.
- If the display currently contains only volumes which were added by specific request, then pressing ENTER will simply update the status of the displayed volumes, and will not check for active swaps.

310.31 CONTINUED . . .

DISPLAY FORMATS

The ISPF dialogs support several alternate display formats.

The default format, as shown on the previous page, has the most information about each volume, but it does take 6 lines per volume which limits the number of volumes which can be displayed at one time. You can, of course, scroll up and down to view the complete list.

Notice that in the upper right of the default format it says "Panel: 1 of 9". This indicates that the default format (panel format 1) is in use.

You can switch to alternate formats using the PF11 and PF10 keys. Currently 4 formats are implemented; more may be added in future releases. The FDRPAS dialogs will remember what format you were using when you last exited from the dialog and will use that format again when you enter the FDRPAS dialog again.

Pressing PF11 once will select panel format 2, which uses 2 lines per volume, e.g.,

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                  SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                               Panel: 2 of 9
Command  Volume  Unit  Swap to                                 Refresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ------------------------------------------------
         TSO001  07C1   2C31     ACTIVE
         Pass: 1    75 % Tracks to copy: 9554   Copied: 7245   Updated: 1091
```

Pressing PF11 again selects panel format 3, which uses only 1 line per volume, e.g.,

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                  SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                               Panel: 3 of 9
Command  Volume  Unit  Swap                                    Refresh 0
         Serial  Addr   to  Comp
          Mask   Mask  Unit  %   Status
-------  ------  ----  ---- ---- ------------------------------------------------
         TSO001  07C1  2C31  75  ACTIVE
```

Pressing PF11 again selects panel format 4, which also uses only 1 line per volume, e.g.,

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                  SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                               Panel: 4 of 9
Command  Volume Unit        SMS   Swap to                      Refresh 0
         Serial Addr      Storage Offline
          Mask  Mask SSID  Group   Unit   Status
-------  ------ ---- ---- -------- ---- ---------------------------------------
         SMS123 07C2 0311 SGWORK   2C32 ACTIVE
```

Pressing PF10 will return to formats 3, 2 and 1.

Format 1 will be shown in the examples in the rest of this section.

310.31 CONTINUED . . .

ADDING VOLUMES TO THE DISPLAY

You can add additional volumes to the display, selecting volumes by the volume serial, unit address, SMS storage group, SSID (subsystem ID), or control unit serial number. The last 3 can be used only if you are using a panel format which includes those fields.

On a blank line (or even a line which currently displays a volume if you no longer want to see it), tab to the field that you wish to use for selection and enter the appropriate value. If a complete volume serial or unit address is entered, only that one volume will be displayed. If you enter a SMS storage group, SSID, or serial number, all volumes matching that value will be displayed. The SSID or serial number is a convenient way to display all volumes in an existing disk subsystem so that you can swap all or some of them to new hardware; it can also be used to verify when all volumes have been swapped off of that subsystem.

For example, if you enter an SSID:

```
 Command  Volume  Unit  Swap to                                      REfresh 0
          Serial  Addr  Offline
           Mask   Mask   Unit     Status
-------  ------  ----  -------   ----------------------------------------------
'''
          Pass:          % Tracks to copy:         Copied:         Updated:
          Source - Reserve:     Level:     Pace:     Type:          Cyls:
          Target - Reserve:     Level:     Pace:     Type:          Cyls:
          Storgrp:           SSID: 0311  CU Serial#:
```

and press ENTER, it will display all volumes in the disk subsystem with that SSID. As many as will fit on the screen will be displayed and you may need to scroll up and down to see the entire list.

Wild card characters can be used to select multiple volumes, storage groups, or control units. An asterisk (*) is the only supported wild card character. If it appears in the middle of a selection string it represents exactly one character, while if it appears at the end it represents one or more characters.

For example,

A volser mask of **DB* will select all online volumes with serials of xxDBxx

A unit address mask of 12* will select all online volumes with addresses of 12xx.

A storage group name of DB**3 will select all online volumes in SMS storage groups with names of DBxx3.

A SSID of *3* will select all online volumes in subsystems with an SSID of x3xx.

ISPF line commands are supported for inserting and deleting entries in the display. In the "Command" column, next to any entry, enter:

D to delete a volume from the display

I to insert a blank entry in the display; it can be modified to add more volumes to the displayed volume list.

310.31 CONTINUED . . .

MONITORING FDRPAS

When active swaps are displayed, you can monitor their progress. The display will look like:

```
 Command  Volume  Unit  Swap to                                      REfresh 0
          Serial  Addr  Offline
           Mask   Mask   Unit     Status
 -------  ------  ----  -------   ---------------------------------------------
          TSO001  07C1   2C31     ACTIVE  CONFIRMSWAP                     (MAIN)
          Pass: 1    75 % Tracks to copy: 9554   Copied: 7245   Updated: 1091
          Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
          Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
          Storgrp:          SSID: 0310  CU Serial#: 14710
```

The status of **ACTIVE** indicates that the swap copy is in progress. In this example, **CONFIRMSWAP** indicates that CONFIRMSWAP=YES was specified on the SWAP request; when the volumes are synchronized, the swap will wait, copying newly updated tracks as necessary, until this panel is used to confirm that the swap is complete. If CONFIRMSWAP is not present, the swap will automatically be completed when the volumes are synchronized. **MAIN** indicates that this is the system on which the swap task is executing.

The status area may contain other messages. For example, if the SWAP is waiting for an operator reply (message FDRW01 or FDRW68), it will indicate so (e.g., WAIT FOR CONSOLE REPLY FDRW68 CAUTION REQUEST). I/O ERROR ON TARGET indicates that SWAPIOERR=RETRY and an I/O error while copying tracks has caused the swap to retry the error periodically until resolved or aborted.

The next line shows the number of the copy pass that is currently executing (see Section 300.02), the percentage complete of the pass, the total number of tracks to copy in the pass, and the number of tracks already copied in the pass. "Updated" indicates the number of tracks which have been updated on the source volume during the current pass, on this system; these tracks (plus those found updated by other systems) will be copied in the next pass.

The next 2 lines show, for the source volume and the target device, the number of RESERVE macros which have been issued against them (the target will always show at least 1, issued by FDRPAS), the IOSLEVEL, and the current I/O pacing value. You can overtype the target pacing value for any active volume to dynamically change the I/O pacing in use (see PACEDELAY= in Section 310.02 for details).

Whenever you press ENTER, the information displayed will be updated. Alternately, you can overtype the number after **REFRESH** with a value. The screen will be updated automatically, every 2 seconds, until this value counts down to zero; the 2 second refresh interval can be changed on the FDRPAS options panel shown later in this section.

310.31 CONTINUED . . .

Once the volumes in a swap with CONFIRMSWAP=YES have been synchronized, the display will look like:

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===> confirmswap                                      SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                              Panel: 1 of 9

Command  Volume  Unit  Swap to                                  REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ---------------------------------------------
         TSO001  07C1   2C31     WAIT FOR CONFIRMSWAP
         Pass: 5     0 % Tracks to copy: 10     Copied: 0      Updated: 52
         Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Storgrp:          SSID: 0310  CU Serial#: 14710
```

To confirm the swaps and cause FDRPAS to complete them, use the Confirmswap command (or just CO). You can:

- enter it in the "Command" column next to each volume to be confirmed
- enter it on the "COMMAND" line at the top of the screen. This will apply to every volume on the display (even those that may not be currently visible) that is in WAIT FOR CONFIRMSWAP status.

Once you enter the command, the display will look like:

```
---------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                  SCROLL ===> PAGE

Press Enter to COnfirm the following selected volumes, or PF3 to return to
prior panel

Command  Volume  Unit  Swap to                                  REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ---------------------------------------------
confirm  TSO001  07C1   2C31     WAIT FOR CONFIRMSWAP
         Pass: 5     0 % Tracks to copy: 10     Copied: 0      Updated: 52
         Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Storgrp:          SSID: 0310  CU Serial#: 14710
```

Only the volumes to be confirmed are displayed. Press ENTER to complete the swap, or press PF3 (END) to ignore the confirmation. Note that the word "confirm" will be filled in on the command field for each volume; you can blank out some volumes before hitting ENTER to exclude them.

Once you confirm the swap, FDRPAS will complete the swap and the display will look like:

```
Command  Volume  Unit  Swap to                                  REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ---------------------------------------------
         TSO001  2C31             SWAPPED
         Pass:         % Tracks to copy:        Copied:        Updated:
         Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-3  Cyls: 3339
         Storgrp:          SSID: 1200  CU Serial#: 41442
```

The unit address, SSID and serial number of the target device are now displayed.

This is also the format of the display for completed swaps when CONFIRMSWAP=YES is not used.

310.31 CONTINUED . . .

INITIATING SWAPS

You can also initiate a swap from the FDRPAS ISPF panels. Note that this is used to start swap tasks only. If multiple systems are involved, FDRPAS monitor tasks for the offline target volumes must be started on every system, via submitted jobs or console commands, before you can start the swap task.

```
----------------------------- FDRPAS Plug & Swap  ------------- Row 1 to 1 of 1
COMMAND ===>                                                   SCROLL ===> PAGE

 Active  COnfirm  SWap  DUmp  Msg  SUspend  REsume  ABort OPtions HIstory SOrt
                                                          Panel: 1 of 9
Command  Volume   Unit   Swap to                              REfresh 0
         Serial   Addr   Offline
         Mask     Mask   Unit     Status
-------  ------   ----   -------   ------------------------------------------
swap     SH20C0   20C0   21c0     INACTIVE
         Pass:             % Tracks to copy:        Copied:        Updated:
         Source - Reserve: 0   Level: 1   Pace:     Type: 3390-9  Cyls: 10017
         Target - Reserve:     Level:     Pace:     Type:         Cyls:
         Storgrp:          SSID: 0310  CU Serial#: 14710

swap     SH20C2  20C2   21c2     INACTIVE
         Pass:          % Tracks to copy:        Copied:        Updated:
         Source - Reserve: 0   Level: 1   Pace:     Type: 3390-3  Cyls: 3339
         Target - Reserve:     Level:     Pace:     Type:         Cyls:
         Storgrp:          SSID: 0310  CU Serial#: 14710
```

To initiate a swap, display one or more inactive online volumes (not currently involved in a swap) as described earlier. In the column "Swap to Offline Unit", fill in a 4-digit device address for the offline target volume to which the online volume is to be swapped. When complete, enter the SWAP command (or just SW) for a swap operation or DUMP (or just DU) for a swapdump operation. You can:

- enter it in the "Command" column next to each volume to be swapped as shown above.
- enter it on the "COMMAND" line at the top of the screen. This will apply to every volume on the display (even those that may not be currently visible) that is in INACTIVE status with a target device filled in.

This will create a FDRPAS started task for each requested swap. See the description of the options on the next page to understand how the FDRPAS started tasks are managed.

Note: the swap task will execute on the system to which your TSO session is logged on. If you are swapping many volumes, for best performance you should spread the swap tasks across several systems, so you may need to logon to other systems to do so. If multiple systems are involved, you must start monitor tasks on every system before initiating the swap (you cannot start monitor tasks from the ISPF dialog).

To avoid accidentally starting many swaps, there is a limit on the number of swaps which can be started at one time from the panel. The limit is on the options panel (see the next page) and defaults to 10. To start more swaps, hit ENTER to refresh the panel, and enter SWAP or DUMP again to initiate more swaps on inactive volumes.

Hint: if you are swapping volumes from one control unit to another, here is an easy way to initiate the swaps with a minimum of typing. On an empty line, enter the address mask for the old control unit, e.g., 17*. On the same line, enter the address mask of the new control unit in the "swap to" column, e.g., 21**. It will display all the volumes which are still online in the old address range (1700-17CF), and will propagate the target address of 21** to each entry. As explained under SWAPUNIT= in Section 310.03, FDRPAS will swap each 17xx disk to the matching 21xx target device.

310.31 CONTINUED . . .

INITIATING SWAPS (Continued)

You can set the options to be used during the SWAP or SWAPDUMP operation by entering the OPTIONS command beforehand to get this panel:

```
---------------------------- FDRPAS Plug & Swap - Options  --------------------
COMMAND ===>                                                 SCROLL ===> PAGE

Options for SWAP command:                Options for SWAPDUMP command:
#SYSTEMS     ===>                        #SYSTEMS     ===>
MIN#SYSTEMS  ===>                        MIN#SYSTEMS  ===>
CONFIRMSWAP  ===> NO     (yes no)        CONFIRMSPLIT ===> NO     (yes no)
CONFMESS     ===> NO     (yes no)        CONFMESS     ===> NO     (yes no)
LOGMESS      ===> YES    (yes no)        LOGMESS      ===> NO     (yes no)
PACEDELAY    ===> 0      1/100 seconds   PACEDELAY    ===> 0      1/100 seconds
SWAPDELAY    ===> 15     seconds         SWAPDELAY    ===> 15     seconds
CHECKTARGET  ===> NO                     CHECKTARGET  ===> NO
LARGERSIZE   ===> NO     (ok no)         LARGERSIZE   ===> NO     (ok no)
PACING       ===> STATIC (dynam static)  PACING       ===> STATIC (dynam static)

Other options:
Max Start    ===> 10     maximum number of simultaneous Swap/Swapdump to start
Maxvols      ===> 1      maximum number of volumes to generate per process
Maxtasks     ===> 1      maximum number of concurrent volumes to process
Interval     ===> 2      refresh interval in seconds
```

You can overtype any of the options shown. The values will be saved in your ISPF profile for use with all subsequent SWAP and SWAPDUMP operations started by this ISPF userid. See Section 310.02 for a description of the options.

The options on the upper part of the panel correspond to options that can be specified on a SWAP or SWAPDUMP statement. See Section 310.02 for a description of these options.

The options on the bottom ("Other Options"), except for the option "Interval", control the submission of swaps from the ISPF panel:

- **Max Start** controls the maximum number of swap requests that will be processed at one time (default: 10). If you request more than this number at once from the main panel, only this number will be processed when you press ENTER and the rest will remain pending; they can be processed by pressing ENTER repeatedly. For example, if you setup 25 volumes on the panel and enter the SWAP or SWAPDUMP command on the command line, the first 10 will be processed on the first ENTER, then next 10 on the next ENTER, and the last 5 on the next ENTER.
- **Maxvols** specifies the maximum number of volumes that the panel will consolidate into a single FDRPAS swap task (address space) when you enter the SWAP or SWAPDUMP command and request that multiple volumes be swapped. It creates a FDRPAS started task with one SWAP/SWAPDUMP statement and multiple MOUNT statements. If the number of volumes requested at one time is larger than **Maxvols**, then multiple FDRPAS started tasks will be created, with up to **Maxvols** volumes in each one. Each FDRPAS started task will process its assigned volumes serially, one at a time, unless **Maxtasks** is greater than 1. The default is 1 (one FDRPAS started task per volume) and the maximum is 250.
- **Maxtasks** is equivalent to the MAXTASKS= operand on the SWAP and SWAPDUMP statement (see Section 310.02). When you request the SWAP or SWAPDUMP of more than one volume at a time, this controls the maximum number of concurrent swaps that FDRPAS will process in a single started task (address space). **Maxtasks** has no meaning unless **Maxvols** is set to a value larger than 1. The default is 1 (process one volume at a time, serially) and the maximum is 32.
- **Interval** is the refresh interval, in seconds (default 2), used when you enter a value for **Refresh** on the main FDRPAS panel. Refresh will count down to zero, every **Interval** seconds, and automatically refresh the display. This allows you to monitor FDRPAS operations without constantly pressing ENTER.

310.31 CONTINUED . . .

SUSPENDING AND RESUMING ACTIVE SWAPS

You can use the FDRPAS ISPF panel to temporarily suspend an active swap without terminating it and resume it later, if needed. While suspended, FDRPAS will not copy any tracks from the source volume to the target device, but it will still monitor the source volume for updates. When resumed, FDRPAS will again copy tracks.

Enter the SUSPEND command (or just SU) in the "Command" column next to the active swap to be suspended. This can be done only on the system running the swap task (indicated by MAIN on the right hand). The status will change to SUSPEND. To resume, enter the RESUME command (or just RE) next to any suspended swap.

```
Command  Volume  Unit  Swap to                                    REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ------------------------------------------
suspend  SH20CC  20CC   21CC     ACTIVE                                (MAIN)
         Pass: 1    89 % Tracks to copy: 1246   Copied: 1110   Updated: 2504
         Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-9  Cyls: 10017
         Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-9  Cyls: 10017
         Storgrp:          SSID: 0310  CU Serial#: 14710
```

You can also reduce the overhead of FDRPAS without totally suspending copy I/O by overtyping the target device pacing value. This value is the number of 1/100 seconds to delay between copy I/Os (each copy I/O typically copies 15 tracks). A pacing value of 5 or 10 will significantly reduce FDRPAS overhead while allowing the swap to continue; however, it will take longer.

TERMINATING ACTIVE SWAPS

You can use the FDRPAS ISPF panel to terminate an active swap, if needed.

Enter the ABORT command (or just AB) in the "Command" column next to the active swap to be aborted. This can be done on a system running the swap task or a system running a monitor task for the volume.

```
Command  Volume  Unit  Swap to                                    REfresh 0
         Serial  Addr  Offline
          Mask   Mask   Unit     Status
-------  ------  ----  -------   ------------------------------------------
abort    SH20CC  20CC   21CC     ACTIVE                                (MAIN)
         Pass: 1    89 % Tracks to copy: 1246   Copied: 1110   Updated: 2504
         Source - Reserve: 0   Level: 1   Pace: 0   Type: 3390-9  Cyls: 10017
         Target - Reserve: 1   Level: 1   Pace: 0   Type: 3390-9  Cyls: 10017
         Storgrp:          SSID: 0310  CU Serial#: 14710
```

310.31 CONTINUED . . .

REPLYING TO CONSOLE MESSAGES

The panel will display swap tasks which are waiting for FDRW01 or FDRW68 console replies, and will allow you to reply to the message from ISPF instead of the console.

This example shows one task waiting for FDRW01 (because CONFMESS=YES was specified) and another waiting for FDRW68 (because the proper number of monitor tasks has not responded).

```
Command  Volume  Unit  Swap to                                        Refresh 0
          Serial  Addr  Offline
           Mask   Mask   Unit     Status
-------  ------  ----  -------   ----------------------------------------------
msg       SY4006  41C6   41C4     WAIT FOR CONSOLE REPLY FDRW01 CONFIRM REQUEST
          Pass:         % Tracks to copy:        Copied:        Updated:
          Source - Reserve: 0   Level: 1   Pace:     Type: 3390-2  Cyls: 2226
          Target - Reserve: 1   Level: 1   Pace:     Type: 3390-2  Cyls: 2226
          Storgrp:          SSID: 00A2  CU Serial#: 00938

msg       SY4007  41C7   41C5     WAIT FOR CONSOLE REPLY FDRW68 CAUTION REQUEST
          Pass:         % Tracks to copy:        Copied:        Updated:
          Source - Reserve: 0   Level: 1   Pace:     Type: 3390-2  Cyls: 2226
          Target - Reserve: 1   Level: 1   Pace:     Type: 3390-2  Cyls: 2226
          Storgrp:          SSID: 00A2  CU Serial#: 00938
```

To reply, enter the MSG command in the command area (or enter MSG on the command line to invoke it for all swaps in the display which are waiting for message reply). You will get this panel which shows the full text of each message. Enter a reply in the appropriate area to reply to the desired messages.

```
---------------------------- FDRPAS Plug & Swap  ------------------ Row 1 of 2
COMMAND ===>                                                 SCROLL ===> PAGE

The following operator console messages are waiting for reply, You may enter a
reply in this panel, or PF3 to return to the prior panel.
--------------------------------------------------------------------------------
Message:  FDRW01 CONFIRM REQUEST TO SWAPDUMP SY4006 TO UNIT=41C4 ON   3 SYSTEMS
REPLY YES OR NO
Reply:
--------------------------------------------------------------------------------
Message:  FDRW68 CAUTION REQUEST TO SWAPDUMP SY4007 TO UNIT=41C5 ON   1 SYSTEMS
  IGNORING NON-RESPONDING CPUS REPLY YES, NO OR RETRY
Reply:
--------------------------------------------------------------------------------
```

310.31 CONTINUED . . .

DISPLAYING SWAP HISTORY

If you enter the HISTORY command (or just HI) on the command line of the FDRPAS panel, you can display FDRPAS history records, as shown above, for all volumes which have been successfully swapped by FDRPAS. History records are described in Section 300.05.

```
---------------------------- FDRPAS Plug & Swap History  ----- Row 1 to 3 of 3
COMMAND ===>                                                  SCROLL ===> PAGE

Command  Volume  Unit  Swapped    System     Date        Time
         Serial  Addr  to Unit
-------  ------  ----  -------   --------  ----------  --------
         SH20CC  20CC  21CC      CPUA      02/05/2001  10:18:43
         SH20CC  20CC  21CC      CPUB      02/05/2001  10:18:44
         SH20CC  20CC  21CC      CPUC      02/05/2001  10:18:42
```

The sample display above shows that volume SH20CC was swapped from address 20CC to 21CC on 3 systems, on the date and time displayed.

On the FDRPAS panel, you have several options for selecting the history records to be displayed:

- if no volumes are displayed on the panel, you can enter HISTORY on the command line to display the most recent swap activity for every volume recorded in the history records. Alternately, you can enter HISTORY ALL to display all swap activity for every volume recorded (for volumes which have been swapped more than once)
- if volumes are displayed on the panel, entering HISTORY or HISTORY ALL will display history only for the displayed volumes
- if you enter HISTORY followed by a volser prefix, such as HISTORY TSO, on the command line, it will display history only for the volumes specified, regardless of whether volumes are displayed or not. You can also follow the prefix with the ALL option, such as HISTORY TSO ALL

320.01 FDRPAS SPECIAL HARDWARE CONSIDERATIONS

This section documents special hardware considerations for the use of FDRPAS. It is as complete as possible and contains all considerations known to Innovation at the time of publication. However, there may be other considerations which have not been identified or which were discovered after publication.

This section should be reviewed carefully before performing any FDRPAS operations.

For the latest updates to hardware considerations, go to the Innovation web site at

www.innovationdp.fdr.com

and click on "FDRPAS Customers" for access to a special FDRPAS FTP site.

PREPARING THE TARGET DEVICES

The target devices must be varied offline to all system images.

However, **you must not** mark the target devices as offline in your I/O configuration. If this is done, the device would be offline at the next IPL and OS/390 will not find the volume at its new location.

MULTI-SYSTEM DETERMINATION

On IBM RVA, StorageTek SVA/V960, EMC Symmetrix 4xxx, IBM 3990-1/2/3 subsystems or any that emulate a 3990-3, the #SYSTEMS= operand must be specified on the SWAP statement, because those systems do not allow FDRPAS to determine the number of systems with access to disks in them.

On EMC Symmetrix 5xxx and 8xxx subsystems, FDRPAS can determine how many systems actually have a source volume online.

On IBM 3990-6, IBM 2105 ESS (Shark) and others which emulate these, FDRPAS can determine how many system images can access the subsystem, but cannot determine which volumes are online on each subsystem. If the FDRPAS source volume is online to some systems or LPARs but is offline or not in the I/O configuration to others with a running MVS system, and those other systems have some devices in that subsystem defined, FDRPAS will expect that system to participate in the swap. If the target device is accessible by that system, and an FDRPAS monitor task is monitoring the target on that system, FDRPAS will automatically determine if it should participate or not. Even if the target device is not accessible on a given system but that system is connected to the swapping system with GRS or MIM, FDRPAS will determine this as long as a monitor task is running on that system.

In some environments, FDRPAS may identify some systems which can access a given disk but are not able to participate in a FDRPAS swap. Since FDRPAS won't know they are unable to participate, they can result in a FDR234 REASON=M message and a FDRW68 message indicating non-responding systems. Possible causes include:

1. systems or LPARs which are currently idle, not running an operating system. This may mean that the system has never been IPLed or the operating system has been shutdown. For LPARs, this means that the LPAR is idle but has not been deactivated
2. systems or LPARs which are running VM but which are not running a MVS-type guest operating system under VM
3. systems or LPARs which are running a non-MVS-type operating system, such as Linux or VSE

320.01 CONTINUED . . .

MULTI-SYSTEM DETERMINATION (Continued)

These systems will usually not be using the MVS volumes which you are swapping, so this is not a problem (if they do use the volumes, be sure to place them offline to those systems before the swap). The systems which have access to a disk volume can be determined using the SIMSWAP command of FDRPAS.

If you have systems which will not participate, you can address them in several ways, in order of preference:

1. add EXCLUDE CPUID= statements in the swap task input for each of the non-participating systems
2. specify the MIN#SYSTEMS=nnn operand on the SWAP or SWAPDUMP statement, to identify the number of systems which **will** participate
3. reply YES to the FDRW68 message after insuring that all the systems which **will** participate have been correctly identified by FDR233 messages

On some disk subsystems, such as Hitachi, it is possible to configure them to emulate either an IBM 3990-3 or a 3990-6 control unit. If they are in 3990-3 mode, they may not support the commands FDRPAS uses to determine the number of systems. The console command:

```
DS QD,devnum
```

will display the real or emulated control unit type. If in doubt, try executing FDRPAS without #SYSTEMS=. If the disk does not support the proper commands, FDRPAS will tell you to add #SYSTEMS=.

EMC SYMMETRIX HARDWARE CONSIDERATIONS

- EMC Symmetrix TimeFinder commands and EMC Snapshot-compatible commands should not be issued to volumes involved in a FDRPAS swap. These commands may fail or they may update the source volume in a way that FDRPAS cannot detect.
- IBM-compatible PAV: if you are using IBM-compatible Parallel Access Volumes in 2105-emulation mode, then see the notes on 2105 ESS PAV below.
- If you have jobstreams which execute EMC utilities or other software which depends on special functions of the EMC Symmetrix system (such as TimeFinder) against volumes in a Symmetrix, and you use FDRPAS to swap those volumes to other hardware which does not support those functions (such as a subsystem from another vendor), you will need to update those jobstreams to eliminate or replace that software.
- See the notes on "Duplex Copy" below for SRDF considerations.

320.01 CONTINUED . . .

EMC CONSISTENCY GROUPS

FDRPAS supports EMC Consistency Groups. However, FDRPAS compatibility with the EMC Consistency Group software requires V4.0.0 or higher of that software with EMC maintenance. For details see the ReadMe file for your version at the EMC FTP site ftp://ftp.emc.com/pub/MVSsoft/ConGroup/.

When the source device is an EMC disk, FDRPAS will issue a hardware query to see if it is part of a consistency group. If so, it will issue the same query against the target device. Unless both devices are EMC disks in a consistency group, the swap will fail with message FDR234 REASON=O.

Then FDRPAS will invoke a EMC API to determine if both the source and target are in the SAME consistency group. If not, the swap will fail with message FDR234 REASON=O.

So, FDRPAS will allow a volume in a consistency group to be swapped only to another volume in the same consistency group. This check is made by the FDRPAS swap task, so if you are not running the consistency group software on every system, you must run the swap on a system where it is running.

Before the swap, you will need to update the group definition to add the FDRPAS offline target device by device address and refresh the group to include it. After the swap, since disks are usually added to consistency groups by volser or SMS storage group, you may be able to remove the device address since the volume is now on the target device.

If you are swapping an EMC volume to a disk in a non-EMC subsystem or to an EMC subsystem that cannot participate in an appropriate SRDF session, you should disable the consistency group before doing the swap, since consistency will not be maintained after the swap.

Because the EMC consistency group software and FDRPAS use some of the same interfaces for monitoring I/O, Innovation does not recommend starting or stopping the EMC software, or disabling or enabling consistency groups, while FDRPAS swaps are running, unless you are certain they will not affect the same devices. Otherwise, FDRPAS swaps may fail and the EMC software may generate error messages; however, no harm will be done to your system.

If the EMC consistency group software library is not in the system linklist, you may need to specify that library as a STEPLIB in the FDRPAS swap task so that FDRPAS can invoke the proper EMC API module.

320.01 CONTINUED . . .

STORAGETEK SVA/V960 AND IBM RVA HARDWARE CONSIDERATIONS

- Snapshot Copy: if a Snapshot copy request copying data to the source volume is detected during a FDRPAS swap operation, the FDRPAS intercepts will mark the snapped tracks as updated and will re-copy them during the next Phase 3 pass.
- Since Snapshot Copy requires multiple I/O operations, to the input and output devices, a Snapshot issued just at the moment that FDRPAS is in the final swap phase on one of the devices the device may fail. Also, if a program has previously determined that two disks are capable of Snapshot, but the FDRPAS has since swapped the output device to an ineligible device, the program may issue a Snapshot request that will fail.
- FDRINSTANT, which uses Snapshot for dataset copies and volume reorganizations, has been modified in V5.4/01 or higher to revert to normal I/O if an FDRPAS swap is in progress on volumes involved when the copy or reorganization starts. If you use earlier levels of FDRINSTANT it may cause FDRPAS to re-copy additional tracks unnecessarily.
- Interval Space Release: the offline target devices must be excluded from Interval Space Release processing. StorageTek fix L2P005N removes this restriction by recognizing FDRPAS target devices.
- If you have jobstreams which execute IBM or StorageTek utilities or other software which depends on special functions of the RVA or SVA/V960 system (such as Snapshot) against volumes in a RVA/SVA/V960, and you use FDRPAS to swap those volumes to other hardware which does not support those functions (such as a subsystem from another vendor), you will need to update those jobstreams to eliminate or replace that software.
- On RVA and SVA/V960 systems, FDRPAS is unable to determine the number of systems which have access to the source volume. You must specify the #SYSTEMS= operand on the SWAP statement for such volumes.

IBM 2105 ESS (SHARK) HARDWARE CONSIDERATIONS

- If you are swapping from a 2105 disk to a non-2105 disk, FDRPAS will turn off feature bits in the DCE (Device Characteristics Extension of the UCB) of the source volume for all features that are not supported by the target device. Any IBM software that was using any of the 2105 features should stop using them so that they will not cause errors when the swap to the new device is completed. These features currently include: Flashcopy, Prefix CCW, Read Track Data CCW, Write Full Track CCW, Write Track Data CCW, Locate Record Erase CCW, and Prestage Trackset CCW.
- IBM FlashCopy: Once a swap has been started, the source volume must not be used as the target of a FlashCopy, since FDRPAS has no way of knowing that the source tracks are being updated.
- PAV: Parallel Access Volumes are supported by FDRPAS. FDRPAS will dynamically disable PAV on the source and target devices during the swap. If you are swapping from one 2105 disk with PAV to another, PAV will be re-enabled after the swap. However, if you are swapping from a disk that does not have PAV to a 2105 disk with PAV or vice-versa, PAV will be disabled on the 2105 device until the next time you IPL; this is an IBM limitation because of fields that exist only in the UCB of a PAV device.

REQUIRED IBM MAINTENANCE: the IBM PAV API that is invoked by FDRPAS is included in OS/390 V2.9 and V2.10 and all releases of z/OS. Customers using PAV on OS/390 V2.8 or below must install the PTF for IBM APAR OW41858 to enable the API. If you do not do so, FDRPAS will be unable to swap to and from volumes with PAV enabled.

320.01 CONTINUED . . .

DUPLEX COPY

If an FDRPAS source volume is the primary volume in a PPRC, XRC, SRDF, or Dual Copy session, you may leave the session active during the swap. However, you must be aware that after the swap is completed the secondary volume will no longer be updated. FDRPAS will warn you if the source volume in a swap is also the primary volume of a duplex copy (currently this works only if the source volume is in a PPRC session). If you need the duplex copy after the swap, and the new device is capable, you must re-establish the session.

Normally you will not want to establish a duplex copy of the target device before the swap is complete. Since FDRPAS must copy all of the data from the source volume to the target device, all of those writes to the target will need to be mirrored on the duplex device and will slow down the FDRPAS copy a great deal. If the duplex copy of the data is critical (such as for disaster/recovery), you can establish the duplex copy before the swap as long as you consider the performance implications.

CONCURRENT COPY

If FDRPAS detects that a Concurrent Copy session is active and doing I/O on a source volume at the end of a swap, it will delay completing the swap until no Concurrent Copy I/O has been detected for 2 minutes. However, this cannot guarantee that the Concurrent Copy session will complete successfully. Because a CC session may involve multiple volumes, it is possible that no CC I/O will be done to one of the volumes in the session for many minutes while other volumes are being processed. FDRPAS will not detect the usage of Concurrent Copy on a source volume unless CC I/O is detected on that volume.

If a "dormant" Concurrent Copy session is still active on a source volume when the swap completes, the Concurrent Copy job will fail since the session cannot be transferred to the new device.

As of this writing, IBM is investigating a problem where concurrent copy may not operate on the target device after a swap, even though the target subsystem is capable of concurrent copy. It has been reported only on OS/390 2.7 and 2.8 and does not appear to occur on recent levels of OS/390 and z/OS. Check the FDRPAS FTP site for the latest status on this problem.

ALTERNATE TRACKS

Alternate tracks were used on "real" 3380 and 3390 disks to recover from defects on the disk surface. When a track was discovered to be defective, an alternate was assigned from a pool of alternate tracks to take its place. These alternate tracks (1 or 3 cylinders, depending on model) were included in the size of the volume recorded in the VTOC and VTOC index.

Modern disks, emulating 3380 and 3390 volumes on RAID disks, do not have traditional alternate tracks. However, some disk subsystems, especially non-IBM disks, emulate that pool of alternate tracks even though they are never assigned. On the other hand, IBM disk subsystems, including the 2105 ESS (Shark) and RAMAC 1, 2, and 3 (but not the RAMAC Virtual Array - RVA) appear to have no alternates at all so their total size appears to be smaller by 1 or 3 cylinders.

This discrepancy has caused problems when volumes are moved from disks that have or emulate alternate tracks to disks that have no alternates, and IBM has had to make changes in the VTOC format to accommodate this. A new function was added to ICKDSF (REFORMAT REFVTOC) to make the proper VTOC changes after such a volume move; however, REFVTOC requires that the volume be offline to all but one system during the operation.

FDRPAS will automatically make the proper adjustments in the VTOC and VTOC index, as well as all in-storage tables, on all systems, when a volume is swapped from a device with alternates to one with no alternates, or vice versa. **It is not necessary to run an ICKDSF REFVTOC function after an FDRPAS swap.**

320.01 CONTINUED . . .

CACHE FAST WRITE

Cache Fast Write is a feature of all cached disk subsystems, which allows data to be held only in cache instead of being written to disk unless necessary. It is commonly used for sort work areas, and may also be used for CICS temporary storage. Although FDRPAS will successfully copy the data tracks that were written using Cache Fast Write, CFW uses a subsystem-wide ID to protect against the lost of CFW data due to the re-initialization of the subsystem. After a FDRPAS swap, the CFW ID of the new subsystem may be different and any application using CFW across the swap may fail. However, new CFW data sets opened after the swap will work correctly. CFW is a consideration only for a FDRPAS SWAP, not a SWAPDUMP.

If FDRPAS detects that Cache Fast Write is in use on a source volume, it will wait until no CFW commands have been issued for 2 minutes before allowing the swap to complete. In most cases this will avoid CFW problems.

If you prefer, the IDCAMS command SETCACHE can be used to enable and disable CFW for all disks in a source subsystem before a swap. You may also be able to update global options in your SORT product to disable the use of CFW while you are doing FDRPAS swaps.

In some cases, your SORT product may be able to recover from a cache fast write error and complete the sort successfully. Consult your SORT documentation.

P/390, R/390 and IS/390 INTERNAL DISKS

You cannot use FDRPAS to swap volumes on a IBM P/390 or R/390 system. These systems run OS/390 in conjunction with an Intel (P/390) or RS/6000 (R/390) system and emulate internal S/390 disks on files of the host operating system. They do not emulate a control unit that can be used by FDRPAS.

An IBM Integrated Server/390 (IS/390) also runs OS/390 in conjunction with an Intel system, but it supports both emulated internal disks and external ESCON-attached disks. FDRPAS cannot be used to swap to or from the internal IS/390 disks, but it can be used to swap between external disks.

MP/3000 and MP/2000 INTERNAL DISKS

You can swap to and from the internal disks in an IBM MP/3000 or MP/2000 system. FDRPAS supports swapping between two internal disks, or to or from an internal disk to an external channel-attached disk. However, an IBM patch to the internal disk emulation code may be required; contact Innovation for the latest status.

320.02 FDRPAS SPECIAL SOFTWARE CONSIDERATIONS

This section documents special software considerations for the use of FDRPAS. It is as complete as possible and contains all considerations known to Innovation at the time of publication. However, there may be other considerations which have not been identified or which were discovered after publication.

This section should be reviewed carefully before performing any FDRPAS operations.

For the latest updates to software considerations, go to the Innovation web site at

www.innovationdp.fdr.com

and click on "FDRPAS Customers" for access to a special FDRPAS FTP site.

SYSTEM RESIDENCE VOLUMES

There are two volumes which are used during a system IPL which are referenced by device address. These volumes can be moved with FDRPAS, but it is your responsibility to update your IPL parameters and system documentation with the new device addresses before the next IPL. Failure to do so may result in the IPL process using the old devices, with unpredictable results.

One of these is the system residence (IPL) volume, or SYSRES. The address of the SYSRES is specified on your hardware console and is usually called the LOAD ADDRESS.

The other is the IODF volume. The IODF volume contains the I/O configuration data sets and may also contain system parameter libraries used during IPL. The address of the IODF volume is also specified on your hardware console as part of a string usually called the LOAD PARAMETER.

Depending on the type of hardware you are using, the LOAD ADDRESS and LOAD PARAMETER may be stored as part of an activation profile. Be sure to update all appropriate activation profiles with the new device addresses.

FDRPAS will identify all swapped volumes with IPL text on the label track or an IODF data set in the VTOC and will generate message FDR252 on the console to warn that such parameter updates may be required.

Although FDRPAS modifies the original device of a swapped volume so that it cannot be mounted, this will not prevent an apparently successful IPL from those old devices.

FDRPAS PROGRAM LIBRARY

You can successfully swap the disk volume containing the FDRPAS program library. However, we recommend that you swap this volume by itself, with no other swaps running.

PAGE AND SWAP DATA SETS

Volumes containing *active local page or swap* data sets cannot be swapped with FDRPAS; volumes with inactive page and swap data sets can be swapped.

Rather than swapping volumes with active page and swap data sets, we suggest that you define new page and swap data sets on new volumes on the desired disk hardware, and migrate the paging activity to them with the console PAGEDEL REPLACE command, or the console PAGEADD and PAGEDEL DELETE commands.

Volumes containing active PLPA and common page data sets (but no active local page data sets) can be swapped with FDRPAS as long as they are not updated by a page-out during the swap. If a page-out occurs, the swap will fail, but you can reattempt the swap at a time when there is likely to be less paging activity. If this can't be done, you will have to define new PLPA and common page data sets on new volumes and activate them with an IPL.

320.02 CONTINUED . . .

SYSTEM COUPLE DATA SETS

System Couple Data Sets (CDS) are used in a Parallel Sysplex, in conjunction with a coupling facility. You need to be aware of considerations when swapping the volume containing the active sysplex CDS. The primary and alternate sysplex CDS data set names are defined in the COUPLExx member of PARMLIB which is in effect. XCF (Cross-system Communication Facility) is be sensitive to I/O delays on the sysplex CDS, so the delays caused when FDRPAS suspends I/O to the volume during a swap may lead to errors.

However, errors are unlikely to occur. No error will be detected unless the XCF "failure detection interval" is exceeded. This interval is also specified in the COUPLExx member of PARMLIB and defaults to 25 seconds. It is very unlikely that FDRPAS would suspend I/O for that long.

Even if the failure detection interval should be exceeded, on z/OS, OS/390 2.7 or above, or earlier OS/390 releases with IBM APAR OW30926 applied, the error will result in console message IXC426D rather than a failure. The operator must simply reply R to that message after the swap completes to retry and continue.

If you wish to be certain that no problems can occur when swapping a volume containing the active sysplex CDS, you have several options:

1) you can increase the failure detection interval on every system with the console command

```
SETXCF COUPLE,INTERVAL=nnn
```

2) you can switch to the alternate sysplex CDS with the console command:

```
SETXCF COUPLE,PSWITCH
```

then swap the volume containing the now-inactive primary sysplex CDS. Afterwards, you can switch back to the primary and swap the volume containing the alternate.

Note: this consideration applies only to the sysplex CDS. Other types of CDSs are not affected. The console command:

```
D XCF,COUPLE,TYPE=SYSPLEX
```

can be used to display the primary and alternate sysplex CDS names, and their volsers. Note that after a swap, the device address displayed by this command may still reflect the source device; this is not a problem.

CICS JOURNAL DATA SETS

There is a consideration for sequential CICS journal data sets. These are the old-format journal files used in older levels of CICS. This does not apply to system logger files which are now the preferred format for CICS journals; in the latest releases of CICS, logger files are the only supported format.

CICS journal files will have a DSORG of PS or PSU and usually have a data set name containing an index level starting with DFHJ. CICS pre-formats these files so that it can recognize a journal file that was not properly closed. However, when swapping a journal file that is currently inactive (CICS not running), FDRPAS may not copy all of the pre-formatted tracks, resulting in CICS startup errors.

This problem will only occur for inactive journal files with DSORG=PS, not PSU (IBM tells us that PSU is the standard, but journal files which were setup long ago may still have DSORG=PS). DSORG=PSU journal files and journal files which are currently allocated by a CICS system will be copied correctly.

If you think you might be subject to this consideration, contact Innovation for a circumvention.

320.02 CONTINUED . . .

ACTIVE DATA SETS

Normally FDRPAS will identify active data sets by testing to see if another task holds a SYSDSN ENQ on the data set. Active data sets are handled with complete integrity during the swap.

For inactive (non-ENQed) sequential (PS), partitioned (PO) and VSAM data sets, FDRPAS will improve performance by copying only the used tracks within those data sets.

In rare cases, a task may use a data set without holding a SYSDSN ENQ on it. One such case is a started task whose program is in the Program Properties Table (PPT) with the NODSI option. If such a task is updating a data set without holding the ENQ, FDRPAS may not be able to insure integrity on the data set. Additional validation is done on PS and VSAM data sets to avoid this problem, but updated partitioned (PO) data sets may not be detected. If you think you may have this exposure, contact Innovation for assistance.

JES3-MANAGED VOLUMES

FDRPAS does not currently support swapping disk volumes managed by JES3. JES3-managed disks are those which are referenced by a DEVICE statement in the JES3 initialization statements. Disks which are not referenced by a JES3 DEVICE statement are managed only by MVS and can be swapped with FDRPAS.

You can execute a SWAPDUMP for a point-in-time backup of a JES3-managed disk.

JES2 SPOOL AND CHECKPOINT VOLUMES

JES2 spool volumes can be swapped with FDRPAS.

Volumes containing JES2 checkpoint data sets can also be swapped, with one consideration: if this is a single-system JES2 checkpoint (not MAS - multi-access spool), the default for the HOLD operand on the MASDEF statement in the JES2 startup parameters is HOLD=9999999, which causes JES2 to hold a permanent RESERVE on the checkpoint volume. FDRPAS cannot swap a volume while a RESERVE is held, so the swap will fail (no harm will be done, but the swap will not be successful). To circumvent this permanent RESERVE, issue this console command on the system owning the checkpoint volume to set the RESERVE time to 1 second:

$T MASDEF,HOLD=100

After the swap you can reissue the command with HOLD=9999999 if you like.

ALLOCATIONS BY FDRPAS

You may notice that FDRPAS may do a dynamic allocation to your system residence volume during its operation. This is normal.

Also, if a FDRPAS step has an error, the FDR998 or FDR997 message issued by FDRPAS at the end of the step may specify “VOL=sysres” with the serial number of your system residence volume. This does not indicate that any error occurred on that volume and can be ignored unless other error messages indicate a true problem with that volume.

320.02 CONTINUED . . .

CATALOGS USING ECS SHARING

If a volume containing a ICF catalog which is enabled for ECS (Enhanced Catalog Sharing) is swapped, ECS sharing will be disabled on that catalog. You will receive message:

```
IEC378I catname REMOVED FROM ECS DUE TO DDR SWAP
```

on each system. ECS uses a coupling facility to transmit catalog information between systems, so it is only available in a parallel sysplex.

IBM implemented this behavior in APAR OW48166, because ECS uses the device address of the catalog in its sharing logic. The text of that APAR says, in part:

"The code has been changed to recognize when the volume has been moved to a new hardware device. Any catalogs currently in ECS that are on the affected device will be removed from ECS and marked temporarily ineligible. In order for the catalogs to be re-enabled for ECS usage, the installation must issue either the

```
MODIFY CATALOG,ECSHR(ENABLE,catname) or
MODIFY CATALOG,ECSHR(ENABLEALL)
```

command. The command to re-enable the catalog(s) may be issued from any system, but should NOT be issued until all systems sharing the catalog have removed it from the CF. This may be verified by issuing MODIFY CATALOG,ECSHR(STATUS) on all sharing systems. All systems that display the catalogs named in the IEC378I message(s) shown above should indicate a status of 'Inact(NonECSAcc)'. Once all sharing systems indicate this, the catalog may be reenabled for ECS use as described above."

ESOTERIC NAMES

Esoteric names are symbolic unit names defined in your I/O configuration which relate to specific device addresses. They are used in UNIT= parameters in JCL and dynamic allocation. For example, UNIT=SYSDA is an esoteric name.

If you are swapping a volume that is included in an esoteric name, and the target device is *not* included in that esoteric name, then any job or dynamic allocation which uses the esoteric name to allocate the volume will fail after the swap is complete. You must either update the esoteric name to include both the source and target devices before the swap, or update the esoteric name immediately after the swap. Consult IBM documentation for information on defining and changing esoteric names.

ALLOCATION BY SPECIFIC DEVICE ADDRESS

It is possible to use specific unit addresses in UNIT= JCL parameters and dynamic allocations to allocate specific disk volumes, e.g., UNIT=3A2 or UNIT=/125A.

It is rare that JCL will use specific unit addresses, but it is more likely that programs which dynamically allocate disk volumes might use MVS services to get the unit address of a disk volume and use that address in a dynamic allocation. If a job or dynamic allocation uses a specific unit address obtained before an FDRPAS swap completes, but does the allocation after the swap, it will fail.

JCL using specific unit addresses should be changed (to use generic or esoteric names, preferably) and programs using dynamic allocation may need to be rerun.

ENQUEUE PROPAGATION

FDRPAS does ENQs with major names of FDRPAS and FDRPASQ and SCOPE=SYSTEMS to indicate that swaps are in progress. They are used to detect duplicate swap requests and inhibit certain operations. It is desirable, but not required, that these ENQs be propagated to all systems involved in the swap. If they are not propagated to some systems, FDRPAS may not be able to detect duplicate swap requests and the ISPF panels on systems running monitor tasks will not detect the swap in progress until synchronization has completed on all systems. However, FDRPAS will still operate correctly even if all the systems involved are not part of the same GRSplex or MIMplex. You should not convert the FDRPAS and FDRPASQ ENQs to SCOPE=SYSTEM.

320.02 CONTINUED . . .

FDRPAS USE OF ICKDSF

If you are using FDRPAS to swap a volume to a larger device, such as a 3390-2 to a 3390-3, you must specify LARGERSIZE=OK. At the end of the swap, if the volume has an active indexed VTOC (VTOCIX), FDRPAS will invoke ICKDSF to rebuild the VTOCIX to reflect the new size of the volume. FDRPAS coordinates the VTOCIX update on multiple systems.

If you have restricted the use of ICKDSF in your installation, you must authorize FDRPAS to invoke ICKDSF. If you fail to do so, the swap will work but the ICKDSF execution will fail and the VTOCIX will be disabled. To re-enable it, you will have to vary the volume offline to every system except one, and run a ICKSDF BUILDIX IXVTOC function on the remaining system.

If you have renamed ICKDSF, contact Innovation for assistance.

CLOSING DATA SETS

It is **not** necessary to close any open data sets on volumes being swapped except as noted above. This includes data sets such as catalogs and databases. The FDRPAS swap is transparent to all applications using the disk volume.

STATIC AND DYNAMIC UCBS

In your I/O configuration, defined with HCD, the UCB for each disk device can be defined as "installation static" or "dynamic". Consult the IBM HCD documentation for details.

You should not swap a volume on an installation static UCB to a dynamic UCB, or vice versa; IBM documents that the results are "unpredictable". Both UCBs must be either installation static or dynamic.

4-DIGIT DEVICE ADDRESSES AND UCBS ABOVE THE LINE

FDRPAS can swap between disk devices with 3 and 4-digit device addresses and between UCBs which are located below the 16MB line and above the 16MB line (LOCANY=YES in the HCD configuration).

However, before you swap a volume to a 4-digit device or a device with its UCBs above the line, you should be sure that all software using the volume has been upgraded to support such devices. It is possible that the volume was on a 3-digit device or a UCB below the line precisely because the software using it has not yet been upgraded.

Note that when FDRPAS swaps between a UCB below the line and one above the line, the target device UCB will be below the line. However, after the next IPL, it will revert to an above the line UCB.

COMPUTER ASSOCIATES (CA) PRODUCTS

There are considerations if certain products from Computer Associates are in use in your installation.

If you use CA-ASTEX, you must contact CA to get any maintenance which affects FDRPAS (or search for FDRPAS on their support site) and apply it. If you do not have all such maintenance applied, you must stop CA-ASTEX before swapping any disk volumes and restart it after swaps are complete.

If you use CA-SCHEDULER at a level **less than** V9.0 and you swap any volume containing data sets used by CA-SCHEDULER, you must stop CA-SCHEDULER before the swap and restart it after the swap. In V9.0 and above, CA-SCHEDULER will not have problems with swap.

ENF SIGNALS

Immediately after a FDRPAS swap completes, an ENF (Event Notification Facility) signal is issued on each system to indicate that the swap was done. Event code 10 (SWAP) is issued, but an ENF exit will translate this to event code 28 (SWAP DYNAMIC) on most systems. Software systems which are sensitive to disk volumes being swapped to new devices will listen for those ENF signals, and can take appropriate action to access the volume on its new device address.

Users of the ACC (Allocation Control Center) or SRS (Space Recovery System) products from DTS Software should insure that fix DTS22560, to monitor ENF swap signals, is installed.

If you have other software products which may be sensitive to the device address of a given volume, ask the vendor if they honor ENF SWAP signals.

320.02 CONTINUED . . .

VERIFYING VOLUME INTEGRITY BEFORE A SWAP

If problems with the VTOC, VTOCIX, VVDS or data sets on a volume are discovered after it has been swapped with FDRPAS, there is a natural tendency to blame it on a problem in FDRPAS. That is always possible, although we hope that it will not occur and have coded FDRPAS to make it very unlikely.

Unfortunately, it may be very difficult to prove or disprove that any problem on a volume was caused by FDRPAS. For many such problems, it is more likely that the problem existed before the volume was swapped but was undiagnosed. FDRPAS will copy these volume structural problems to the new device.

So, Innovation recommends that you take steps to diagnose and repair (or at least document) such problems before volumes are swapped. There are several tools you can use:

- if you are licensed for COMPAKTOR from Innovation or you have a FDRPAS trial tape which contains all FDR products, a CPK MAP will diagnose most VTOC errors (VOL= may specify a volume serial, a volser prefix (ABC*) or just * to check all online volumes):

```
//MAP       EXEC  PGM=FDRCPK,REGION=0M
//STEPLIB    DD   DISP=SHR,DSN=loadlib
//SYSPRINT   DD   SYSOUT=*
//SYSMAP     DD   SYSOUT=*
//SYSIN      DD   *
  MAP VOL=volser,MAPS=SUMMARY
```

- if you are licensed for FDRABR or FDREPORT from Innovation or you have a FDRPAS trial tape which contains all FDR products, a FDREPORT can diagnose most VVDS errors (VOL= may specify a volume serial, a volser prefix (ABC*) or just * to check all online volumes):

```
//DIAG      EXEC  PGM=FDREPORT,REGION=0M
//STEPLIB    DD   DISP=SHR,DSN=loadlib
//SYSPRINT   DD   SYSOUT=*
//SYSIN      DD   *
  SELECT VOL=volser
  PRINT  ENABLE=DIAGNOSEVVDS
```

- you can use IDCAMS to diagnose VVDS and catalog errors:

```
//DIAGVVDS EXEC   PGM=IDCAMS,REGION=0M
//SYSPRINT  DD    SYSOUT=*
//VVDS      DD    UNIT=DISK,VOL=SER=volser,DISP=SHR,
//            DSN=SYS1.VVDS.Vvolser,AMP='AMORG'
//SYSIN     DD    *
  DIAGNOSE VVDS INFILE(VVDS)
//DIAGCAT   EXEC  PGM=IDCAMS,REGION=0M
//CAT       DD    DSN=CATALOG.TSMSUSER,DISP=SHR
//SYSPRINT  DD    SYSOUT=*
//SYSIN     DD    *
  DIAGNOSE  ICFCATALOG INFILE(CAT)
```

320.02 CONTINUED . . .

VERIFYING VOLUME INTEGRITY BEFORE A SWAP (Continued)

- you can use IDCAMS to verify the structure of VSAM clusters (including catalogs):

```
//EXAMINE   EXEC    PGM=IDCAMS,REGION=0M
//SYSPRINT  DD      SYSOUT=*
//SYSIN     DD      *
  EXAMINE NAME(clustername) DATATEST INDEXTEST
```

- other tools from IBM and other software vendors can be used to check for problems in data bases and other data set types

Note: if you are executing a trial copy of FDRPAS, your trial distribution tape includes all FDR components, including COMPAKTOR and FDREPORT. If you found the above diagnostics useful but are not licensed for those components, contact Innovation for information on other benefits of FDR and licensing requirements.

FULL-VOLUME RESTORE AND COPY

If FDR, DFSMSdss or another disk backup/restore product is used to do a full-volume restore or copy to a volume which FDRPAS is currently swapping to another device, you should examine the volume after the swap is complete to insure that the device characteristics in the VTOC and VTOC index (VTOCIX) are correct.

A full-volume restore or copy operation may make changes to the volume size in the VTOC and VTOCIX when:

- the target device is larger than the volume on the backup (for a restore) or the source volume (for a copy)
- the target device has no alternate tracks while the original volume does have alternate tracks, or vice versa (see the discussion of alternate tracks earlier in this section).

Unfortunately, the full-volume restore/copy program may make decisions about the VTOC changes to make based on the characteristics of the volume at the time the restore/copy begins. When FDRPAS is swapping the device, this would be the original source device. However, the restore/copy may not complete until **after** FDRPAS has swapped the volume to its new device. The new device may not have the same alternate tracks and it may be a larger device than the original. The decisions made by the restore program before the swap may not be valid after the swap, so the changes it makes to the VTOC and VTOCIX may not be valid.

In addition, FDRPAS itself may make changes to the VTOC and VTOCIX when the alternate tracks and device size of the target device are different from the source device. FDRPAS and the restore program may make conflicting changes to the VTOC. Even worse, if the restore/copy program changes the location of the VTOC or VTOCIX during the restore, FDRPAS may update the wrong copy of the VTOC or VTOCIX.

If you know that a full-volume restore or copy was done during a FDRPAS swap, you should use tools such as FDREPORT, COMPAKTOR, IEHLIST, or other disk mapping software to validate that the number of data cylinders in the VTOC and VTOCIX is correct.

In any case, it makes little sense to use FDRPAS to swap a volume if you are going to completely replace it with a restore or copy. If you know that a restore/copy will be done, it would be simpler to restore or copy the volume to its new device directly instead of using FDRPAS at all.

Note: this consideration does not apply to data set restores and copies.

PROGRAMS WHICH ACCESS OFFLINE DISKS

You should avoid executing programs which access offline disk devices, since they may access or modify a FDRPAS target device during the swap, with unknown results.

ICKDSF can be used to initialize or modify offline disks. You should not run ICKDSF against a FDRPAS target device. FDRPAS does check to see if the target volume has been reinitialized and will terminate the swap.

The IXFP program (used with IBM RVA disks) and the SVAA program (used with StorageTek SVA and V960 disks) may access offline disks when the "space utilization" report is run. This may result in a warning message (SIB0355W) if a FDRPAS target disk is accessed during a swap. No harm is done and you can either ignore the message or avoid running that report during a swap. StorageTek fix L2P005N for SVAA resolves this problem by recognizing FDRPAS target devices.

320.02 CONTINUED . . .

SYSTEM NAMES

Many FDRPAS messages, and other parts of this document, refer to "systems" or "system names". Some FDRPAS messages refer to them as CPUs.

These system names come from the field CVTSNAME in the CVT (Communication Vector Table) of each system (sometimes referred to as a "system image", an "image" of the operating system). The system name is assigned by the IEASYSxx member of PARMLIB. Each system involved in a FDRPAS swap must have a unique system name.

To display the name of a system, enter this console command on a console connected to the system:

```
D GRS
```

and you will receive a display similar to:

```
ISG343I 12.46.18 GRS STATUS 348
SYSTEM    STATE       COMM    SYSTEM    STATE       COMM
CPUB      ACTIVE              CPUC      ACTIVE       YES
```

The first system listed (CPUB in this example) is the system name of this system.

CPU SERIAL NUMBERS

Some FDRPAS messages include CPU serial numbers. You may also need to specify a CPU serial number on an EXCLUDE statement.

To get the CPU serial number of a system, execute this console command from a console attached to that system:

```
D M=CPU
```

You will get a response similar to:

```
IEE174I 10.54.11 DISPLAY M
PROCESSOR STATUS
D  CPU                  SERIAL
0    +                   0309417060
1    +                   1309417060
```

Note that the first digit may be non-zero if you have a multi-processor system, as shown in this example. The first digit will always be zero in FDRPAS message and parameters. The second digit is an LPAR number, if you have a system with multiple LPARs defined.

320.02 CONTINUED . . .

FDRPASV1 UTILITY

After a SWAP operation, FDRPAS will leave the source device offline with a volume label modified so that it cannot be accidentally brought online. The source device becomes a point-in-time image of the volume, frozen at the time that the final phase of the swap occurred. Although you can backup this point-in-time image using FDRINSTANT, you may want to vary this copy of the volume online to another system for backup or other purposes.

After a SWAPDUMP operation, FDRPAS will leave the target device offline with a volume label modified so that it cannot be accidentally brought online. The target device is a point-in-time image of the volume, frozen at the time that the SWAPDUMP operation ended. Although you can backup this point-in-time image of the volume using FDRINSTANT, you may want to vary this copy of the volume online to another system for backup or other purposes.

To meet either need you can use the FDRPASV1 utility to "correct" the volume label and make the volume mountable again. To execute FDRPASV1 on a single volume, use this JCL:

```
//FDRPASV1  EXEC  PGM=FDRPASV1
//STEPLIB    DD    DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT   DD    SYSOUT=*
//DISK1      DD    UNIT=SYSALLDA,
//               VOL=SER=vvvvvv,
//               DSN=FDR.USE.UNITuuuu,
//               DISP=OLD
```

where "vvvvvv" is any online non-SMS volume serial, and "uuuu" is the 4-digit device address of the offline volume to be made mountable (the source device for a SWAP or the target device for a SWAPDUMP). The online disk volume will not be modified in any way.

To execute FDRPASV1 on a multiple volumes in a device address range, use this JCL:

```
//FDRPASV1  EXEC  PGM=FDRPASV1,PARM='UNIT=u*'
//STEPLIB    DD    DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT   DD    SYSOUT=*
//DISK1      DD    UNIT=SYSALLDA,
//               VOL=SER=vvvvvv,
//               DISP=OLD
```

where "vvvvvv" is any online volume serial, and "u*" is the prefix of a range of 4-digit device addresses, such as UNIT=01C* for devices 01C0-01CF, or UNIT=2* for devices 2000-2FFF. Only offline devices in that range will be modified. The online disk volume will not be modified in any way.

Warning: after running FDRPASV1, the offline device will have a valid volume label with the same serial as the online volume. You must be certain that this device is not varied online in place of the active volume, especially during an IPL. You may want to run a ICKDSF REFORMAT to change the volume serial of the volume to be sure.

320.03 FDRPAS VM CONSIDERATIONS

If you run VM in your installation, there may be special considerations. The following outlines the considerations, but if you are uncertain, please call Innovation for guidance.

FDRPAS can be used to swap volumes used by MVS guest systems running on VM virtual machines. However, it cannot be used to swap volumes used by VM itself, since VM will be unaware of the swap and will continue to use the old device.

FDRPAS identifies systems participating in a swap by their CPU IDs (also called "serial numbers"). A VM system has such a CPU ID determined by the hardware it is running on, but MVS guest systems running on VM virtual machines have simulated CPU IDs controlled by VM; these simulated CPU IDs may be the same as the VM hardware ID (the default) or may be overridden in the VM directory (CPUID parameter). The way that your installation sets the CPU IDs of MVS guest systems affects how they will impact FDRPAS.

There are several different ways which you might be running VM and MVS guest systems:

VM WITH NO MVS GUESTS

If you run VM with no MVS guest systems running beneath it, then the VM system does not have to participate in the FDRPAS swap operation at all. However, if the source volume in a FDRPAS operation is accessible by the VM system, the disk hardware may report the CPU ID of the VM system; in this case you should use the EXCLUDE statement (Section 310.04) to exclude it. If the source volume is in an IBM 3990-3 or other control unit which does not report the CPU IDs, then simply specify the #SYSTEMS= parameter with a value which does not include the VM system, only the OS/390 or z/OS systems with access to the volume.

VM WITH A SINGLE MVS GUEST AND DEDICATED DISKS

If the FDRPAS source disk is dedicated (via the DEDICATE statement in the VM directory or the VM ATTACH command) to one MVS guest (even if you have other MVS guests active), then you do not need to do anything special. Simply start a FDRPAS swap task or monitor task on the MVS guest as you would on any other MVS system. The target device must also be defined to VM and dedicated to the MVS guest.

If the disk is attached to other MVS systems not under VM, run FDRPAS tasks on those systems as well.

VM FULL-VOLUME MINI-DISKS

If the FDRPAS source disk is defined as a full-volume VM mini-disk (via the MDISK statement in the directory entry of one or more MVS guest systems). There are special procedures. These notes apply even if only one MVS guest is using the volume, but full-volume mini-disks are used mainly when multiple MVS guests must share the volume. The target device must also be defined to VM and defined as a full-volume mini-disk to every MVS guest.

A full-volume VM mini-disk does not support some of the special commands used by FDRPAS, so a normal monitor task will not work. You need to use a special monitor task with these control statements:

```
MONITOR TYPE=JOIN
MOUNT SWAPUNIT=xxxx
```

where "xxxx" specifies a single specific target unit address (not a prefix). To swap multiple volumes, you must submit separate monitor tasks. Do not submit this type of monitor task on the system where the swap task will run.

320.03 CONTINUED . . .

VM WITH MULTIPLE MVS GUESTS

On the SWAP statement, in the swap task, you must specify the parameters:

```
#SYSTEMS=nnn,MIN#SYSTEMS=nnn
```

where "nnn" is the actual number of systems (including all the MVS guests) that will participate in the swap; use the same value in both parameters. It is very important that you specify this value accurately.

Every MVS system participating in a swap must have a unique CPU ID. If you have multiple MVS guests running under VM, and two or more of them are involved in a swap, by default VM will let each guest use the same CPU ID and FDRPAS cannot tell them apart. There are two ways to address this:

1) you can give each MVS guest a unique virtual CPU ID by using the CPUID parameter in the VM directory entry for each guest. The CPU ID values assigned can be any valid value, as long as they are unique.

2) You can tell FDRPAS to use a simulated CPU ID in each monitor tasks by inserting this statement after the MONITOR statement in the FDRPAS input:

```
PROFILE  CPUID=xxxxxxxxxx
```

providing any valid 10-character CPU ID, as long as it is unique for each guest. This value will be used only by FDRPAS and will not affect any other use of the CPU ID.

Note: the first character of the CPU ID is ignored by FDRPAS since it represents the CPU number on a multi-processor system. The CPU IDs must be unique in the last 9 characters. Innovation recommends that you make the CPUID unique by changing only the second digit (normally used as the LPAR number) so that the rest of the serial will still match the hardware CPU ID of the system.

A FDRPAS swap jobstream for execution on a MVS guest with full-volume mini-disks shared by 2 other guests might look like:

```
//SWAP       EXEC  PGM=FDRPAS,REGION=0M
//SYSPRINT    DD   SYSOUT=*
//SYSUDUMP    DD   SYSOUT=*
//SYSIN       DD   *
   SWAP      TYPE=FULL,#SYSTEMS=3,MIN#SYSTEMS=3
   MOUNT     VOL=ABC123,SWAPUNIT=125A
```

The FDRPAS monitor jobstream for execution on the other two MVS guests might look like:

```
//MONITOR    EXEC  PGM=FDRPAS,REGION=0M
//SYSPRINT    DD   SYSOUT=*
//SYSUDUMP    DD   SYSOUT=*
//SYSIN       DD   *
   MONITOR    TYPE=JOIN
   PROFILE   CPUID=0574329672 (if required to provide unique CPU ID)
   MOUNT     SWAPUNIT=125A
```

On some types of disk hardware, FDRPAS will generate message FDR234 REASON=L because the CPU ID of the MVS guest the swap task is executing on is not in the list of CPU IDs returned by the disk hardware; this occurs because the disk hardware only knows the CPU IDs of the physical systems and are unaware of the virtual CPU IDs used by the MVS guest systems. This is normal and can be ignored as long as the proper number of systems participate. If one of the MVS guests uses the real CPU ID of the processor hardware (the VM default), you can run the swap task on that system to avoid the FDR234 REASON=L.

320.04 FDRPAS E-MAIL NOTIFICATION FACILITY

FDRPAS includes a facility which can send an e-mail message when a FDRPAS operation on a volume completes unsuccessfully, successfully or both. This can be useful when you, the FDRPAS user, are not on-site or are not monitoring FDRPAS. If you have an alpha-numeric pager or cell phone capable of receiving text messages, this can also be used to send a message to the pager or cell phone.

REQUIREMENTS FOR SUCCESSFUL E-MAIL

To successfully send an e-mail from FDRPAS, you must:

- be running the IBM TCP/IP product (a standard component of OS/390 and z/OS).
- have an external Internet connection to your mainframe which allows you to send e-mail or communicate with an external e-mail server. Your firewall, if any, must allow the e-mail or server connection.
- have access to a mail server which supports SMTP (Simple Mail Transfer Protocol). This can be the optional SMTP mail server which is delivered with the IBM TCP/IP product (running on your OS/390 or z/OS system), or an external mail server (check with your mail server administrator to see if it supports SMTP)
- run the FDRPAS task under a RACF userid with an OMVS segment (or the equivalent in other security systems), since the IBM TCP/IP product uses USS (Unix System Services) sockets.

The last example in this section can be used to test if the above requirements have been met and your e-mail parameters are correct.

SENDING E-MAIL

By default, FDRPAS will send an e-mail only when certain triggering error messages are issued. Optionally, you can send e-mail indicating a successful operation as well. If FDRPAS issues consecutive triggering messages with identical text, the messages after the first are ignored.

You can specify the subject line for the e-mail and you can provide any message text you like, with any number of lines of text. FDRPAS supports substituting certain strings in the subject or message text, allowing the message to include the FDRPAS job and/or step name, the name of the system on which the operation executed, and the date/time of the e-mail. The text of the triggering FDRPAS message is included, which will usually identify the volume.

FDRPAS can also e-mail the complete set of messages generated by the FDRPAS operation on the volume. This is supported only if you are using the FDRPAS subtask option MAXTASKS=nn.

The e-mail can be sent to up to 5 recipients. If your mail server supports group names, you can send it to a group name which can be distributed to many recipients.

If your pager or cell phone company supports sending text messages by e-mail, the message can be directed to your pager or cell phone. Consult your provider for the proper e-mail address and requirements.

320.04 CONTINUED . . .

FDREMAIL DD STATEMENT

To invoke the FDRPAS e-mail facility for a given FDRPAS step or started task, include in the step JCL an FDREMAIL DD statement pointing to the e-mail control statements, which are described below. This DD can specify a sequential data set, a member of a PDS, or in-line control statements. If it is a data set, it must be LRECL=80, RECFM=F or FB. If it specifies DD DUMMY, it is ignored. It is also ignored in MONITOR tasks except for control statement errors.

No additional options are required, the presence of the DD statement is sufficient to activate the facility. However, if you want to be notified of successful FDRPAS operations as well as failures, you must specify the operand EMSG=OK on the SWAP, SWAPDUMP, or SWAPBUILDIX statement.

Examples:

```
//FDREMAIL   DD  DISP=SHR,DSN=yourid.FDRPAS.EMAIL
//FDREMAIL   DD  DISP=SHR,DSN=yourid.FDRPAS.CNTL(EMAIL)
//FDREMAIL   DD  *
   ..  e-mail statements ..
```

The PASPROC procedure distributed with FDRPAS, used for starting FDRPAS as a started task as well as in batch jobs, includes a FDREMAIL DD which defaults to DSN=NULLFILE (equivalent to DD DUMMY). You can specify the parameter EMAIL=dsname to activate the e-mail facility, e.g.,

```
S PASPROC.SWAP1,PARM=' SWAP TYPE=FULL/ MOUNT VOL=ABC123,SWAPUNIT=4321',EMAIL=FDRPAS.EMAIL
```

SYSTCPD DD STATEMENT

The SYSTCPD DD statement points to TCP/IP parameters used on your system. It is optional, but if it is present, and it contains the IP address of a domain name server, then you can specify the name of a mail server instead of its IP address; TCP/IP will use the domain name server to resolve the name. Your installation may have defined the name of a default TCPDATA data set, in which case the DD statement can be omitted.

If it is omitted and your installation has not defined a default TCPDATA, you will have to specify the IP address of the mail server in "dotted-decimal" format.

If you don't know what to put on this DD, consult the system programmer responsible for TCP/IP on your system.

Example:

```
//SYSTCPD DD  DISP=SHR,DSN=TCPIP.TCPDATA(CPUC)
```

320.04 CONTINUED . . .

BASIC E-MAIL STATEMENTS

The FDREMAIL DD statement must point to the e-mail statements which define your mail server, the "sender's" e-mail address, the recipients' e-mail addresses, and the e-mail text. See "Enhanced E-mail Statements" below for details on sending multiple messages and customizing the message.

These statements must appear in the order shown below, although optional statements can be omitted. Only the first 72 characters of each line will be processed. Lines with an asterisk (*) in column1 are treated as comments, except when they are data lines.

TCPNAME – this optional statement contains the name of the TCP/IP address space (started task) on the system where you are executing. If omitted, FDR will connect to the first active TCP/IP address space, so it can usually be omitted unless you need to use a particular TCP/IP stack. There must be exactly one space after TCPNAME. For example,

```
TCPNAME ENSRV001
```

MAILSERVER – this optional statement contains the name or IP address of your mail server. This server must support the SMTP protocol (consult the mail server administrator if you are not sure). If omitted, FDR will attempt to use the SMTP server running on your OS/390 or z/OS system; if that SMTP server is not active, you must provide a MAILSERVER statement. There must be exactly one space after MAILSERVER.

If you have included a SYSTCPD DD statement or your installation has defined a default TCPDATA data set, and the parameters specify the address of a domain name server, you can specify the name of the mail server. For example,

```
MAILSERVER MAIL.MYCOMPANY.COM
```

You can also specify the IP address of the mail server, in standard "dotted-decimal" format. If a name server is not available, you must specify the IP address. For example,

```
MAILSERVER 123.45.6.234
```

Note: you can use the TCP/IP PING command under TSO to get the IP address of your mail server, e.g.,

```
PING MAIL.MYCOMPANY.COM
```

FROM: - this required statement defines the e-mail address of the "sender" of the e-mail, in any format accepted by your mail server, up to 66 characters. This address is used by SMTP for notification of undeliverable messages. It may also be used by the mail server for authentication, so it may need to be a valid address known to that server. For example,

```
FROM:<STORMGMT@MYCOMPANY.COM>
```

TO: or CC: - this statement defines the e-mail address of a recipient of the e-mail, in any format accepted by your mail server, up to 66 characters. You must include at least one TO: statement and can have up to 5 TO: or CC: statements. For example,

```
TO:<JANEDOE@MYCOMPANY.COM>
```

```
TO:John_Smith@mycompany.com
```

```
CC:Bob Jones<BJONES@MYCOMPANY.COM>
```

SUBJECT: - this required statement defines the subject for the e-mail message. The text may contain symbolic substitutions as described below. For example,

```
SUBJECT: FDRPAS FAILURE JOB=&JOBNAME
```

Data lines – optionally include any number of data lines after the SUBJECT: statement to define the e-mail message to be sent. Don't forget that pagers and cell phones may truncate long messages. The text may contain symbolic substitutions as described below. For example,

```
FDRPAS JOB &JOBNAME FAILED ON SYSTEM &SYSTEMS
&MESSAGE
```

320.04 CONTINUED . . .

SYMBOLIC SUBSTITUTION

The e-mail subject line or data lines may contain certain symbolic parameters, which FDR will replace with appropriate values before the e-mail is sent. The values are:

&JOBNAME - the name of the FDRPAS job or started task.

&STEPNAME - the name of the FDRPAS step.

&SYSTEMS - the name of the system on which FDRPAS was executing.

&EMAILDATE - the date that the e-mail was generated by FDR, in mm/dd/yyyy format.

&EMAILEDAT - the date that the e-mail was generated by FDR, in dd/mm/yyyy ("European") format.

&EMAILTIME - the time that the e-mail was generated by FDR, in hh:mm:ss.t format.

&MESSAGE or **&MSG** - the text of the FDRPAS message that triggered the e-mail. This symbolic must be the last or only thing on the line on which it appears. If this symbolic does not appear in the e-mail text, the message will be automatically included as the last line of the message, so it is usually not required unless you want to include the message in the subject text or position it.

&ALLMSG - results in multiple lines in the e-mail, containing all of the messages associated with the volume. It works only if FDRPAS subtasking (MAXTASKS=nn) was used. This symbolic must be the only thing on the line on which it appears. Do not use on a SUBJECT: line.

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ENHANCED E-MAIL STATEMENTS

In order to meet more complex notification requirements, the FDRPAS e-mail facility can also:

- send varying e-mail text to different recipients (for example, send a one line notification to one address, and send the full set of messages to another)
- send different e-mail texts depending whether the volume completed successfully or unsuccessfully. You can even vary the e-mail text depending on the FDRPAS message that triggered the e-mail

The enhanced e-mail is invoked by an additional e-mail statement:

EMAIL: - indicate the start of an e-mail message definition and terminates the data lines of the previous message. If omitted, there is only a single e-mail definition as described under "Basic E-Mail Statements" above. It can optionally appear before the first FROM: statement, and it is inserted after the data lines of a message definition to separate the next message definition. It has an optional operand **MSG=** which is separated from EMAIL: by one space.

The EMAIL: statement may be followed by the TCPNAME, MAILSERVER and/or FROM: statements, but if omitted, the previous values will be used. It **must** be followed by one to five TO: statements to define the recipients of this e-mail. The TO: and CC: statement(s) are followed by a new SUBJECT: statement and optionally new data lines to define the e-mail text.

The MSG= operand controls when the following e-mail will be sent and has several forms:

- **MSG=OK** - send only for successful FDRPAS volume operations (when the triggering message is not followed by **). Note that you must specify the EMSG=OK operand on the SWAP, SWAPDUMP or SWAPBUILDIX statement to invoke the e-mail processor for successful completions.
- **MSG=ERR** - send only for unsuccessful FDRPAS volume operations (when the triggering message is followed by **).
- **MSG=nnn** or **MSG=(*nnn,nnn,..*)** - send only if the message which triggered the e-mail is FDRnnn . The triggering messages currently include FDR999 (successful, only if EMSG=OK was specified), FDR997 and FDR998 (completed with errors), FDR319 (subtask abend), FDR302 (control card error), and certain FDR234 (swap error) messages.

An example of enhanced e-mail statements is:

```
MAILSERVER 12.132.14.178
FROM:JOHNDOE@MYCOMPANY.COM
EMAIL: MSG=ERR
*  SEND ALL FAILURE MESSAGES TO DICK
TO:DICK<DICK@MYCOMPANY.COM>
SUBJECT: FDRPAS SWAP FAILED &JOBNAME &STEPNAME &SYSTEMS
EMAIL: MSG=302
*  IF JOB FAILED FOR CONTROL CARD ERRORS, NOTIFY JANE
TO:JANE<JANE@MYCOMPANY.COM>
SUBJECT: FDRPAS CONTROL CARD ERROR
&MESSAGE
JOB &JOBNAME MUST BE RE-SUBMITTED
EMAIL: MSG=OK
*  FOR SUCCESSFUL SWAP, SEND ALL MESSAGES TO SPOT
TO:SPOT<SPOT@MYCOMPANY.COM>
SUBJECT: FDRPAS MESSAGES: &MESSAGE
&ALLMSG
```

320.04 CONTINUED . . .

E-MAIL EXAMPLES

Send an e-mail if the swap of volume DATA22 fails. Since no SYSTCPD DD is provided, the MAILSERVER statement must specify the IP address of the mail server. The e-mail will include the text of the error message.

```
//SWAP          EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB        DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT       DD   SYSOUT=*
//SYSUDUMP       DD   SYSOUT=*
//FDREMAIL       DD   *
MAILSERVER 12.132.14.178
FROM:<ABC@MYCOMPANY.COM>
TO:<XYZ@MYCOMPANY.COM>
SUBJECT: DATA22 SWAP FAILED
//SYSIN          DD   *
     SWAP      TYPE=FULL
     MOUNT     VOL=DATA22,SWAPUNIT=07C3
```

Send an e-mail for each volume in this step indicating success or failure. Since a SYSTCPD DD is provided, the MAILSERVER statement can specify the name of the mail server. "PASLIST" is the name of a group which will be interpreted by the mail server. The e-mail will include the text of the message to identify the volume.

```
//SWAP          EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB        DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT       DD   SYSOUT=*
//SYSUDUMP       DD   SYSOUT=*
//SYSTCPD        DD   DISP=SHR,DSN=TCPIP.DATA(SYSTEM1)
//FDREMAIL       DD   DISP=SHR,DSN=STGMGMT.FDRPAS.CNTL(EMAIL)
//SYSIN          DD   *
     SWAP      TYPE=FULL,EMSG=OK
     MOUNT     VOL=TSO001,SWAPUNIT=1A**
     MOUNT     VOL=TSO002,SWAPUNIT=1A**
       .  .  .
     MOUNT     VOL=TSO099,SWAPUNIT=1A**
/*
Data set STGMGMT.FDRPAS.CNTL(EMAIL) contains:
MAILSERVER MAIL.MYCOMPANY.COM
FROM:JOHN DOE<JOHNDOE@MYCOMPANY.COM>
TO:PASLIST@MYCOMPANY.COM
SUBJECT: FDRPAS SWAP ENDED &SYSTEMS, JOB &JOBNAME, STEP
&STEPNAME
MESSAGE - &MESSAGE
```

320.04 CONTINUED . . .

E-MAIL EXAMPLES (Continued)

Send an e-mail to several recipients for each volume in this step which fails. Since a SYSTCPD DD is provided, the MAILSERVER statement can specify the name of the mail server. The e-mail will include all messages generated for the failing volume. Also send a 1-line notification to a pager.

```
//SWAP         EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB       DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT      DD   SYSOUT=*
//SYSUDUMP      DD   SYSOUT=*
//SYSTCPD       DD   DISP=SHR,DSN=TCPIP.DATA(SYSTEM1)
//FDREMAIL      DD   DISP=SHR,DSN=STGMGMT.FDRPAS.CNTL(EMAILALL)
//SYSIN         DD   *
     SWAP      TYPE=FULL,MAXTASKS=10
     MOUNT     VOL=TS0001,SWAPUNIT=1A**
     MOUNT     VOL=TS0002,SWAPUNIT=1A**
       . . .
     MOUNT     VOL=TS0099,SWAPUNIT=1A**
/*
Data set STGMGMT.FDRPAS.CNTL(EMAILALL) contains:
MAILSERVER MAIL.MYCOMPANY.COM
FROM:<DILBERT@MYCOMPANY.COM>
TO:<DOGBERT@MYCOMPANY.COM>
TO:<CATBERT@MYCOMPANY.COM>
CC:<DILBERT@MYCOMPANY.COM>
SUBJECT: SWAP FAILED ON &SYSTEMS &EMAILDATE &EMAILTIME &MSG
&ALLMSG
EMAIL:
TO:Pager<9735552345@VTEXT.COM>
SUBJECT: FDRPAS ERROR &MSG
```

This jobstream can be used to test your e-mail parameters and verify that you can successfully send an e-mail via SMTP. It will cause a control statement error which will invoke the e-mail facility.

```
//BADSWAP      EXEC  PGM=FDRPAS,REGION=0M
//STEPLIB       DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSPRINT      DD   SYSOUT=*
//SYSUDUMP      DD   SYSOUT=*
//FDREMAIL      DD   *
MAILSERVER 12.132.14.178
FROM:Me<ME@MYCOMPANY.COM>
TO:Me<ME@MYCOMPANY.COM>
SUBJECT: E-MAIL TEST
//SYSIN         DD   *
     SWAP      TYPE=ZZZZ   DELIBERATE CONTROL STATEMENT ERROR
```

380.01 LOADING THE FDRPAS LIBRARIES FROM THE DISTRIBUTION TAPE

Note: if you have downloaded FDRPAS from the Innovation FTP site, it will come with an instruction file; use those instructions instead of this section (380.01).

The FDR Tape Install program, FDRLOAD, makes the installation of an FDRPAS distribution tape very easy. You can execute FDRLOAD directly from tape if you have access to a TSO userid that has the "MOUNT" attribute, or if you are able to issue or request a command on a system console to have a tape mounted. Otherwise, you must copy the Tape Install program to disk using the JCL shown in Step 3.

If you have access to a TSO userid with the MOUNT attribute, logon to that id and proceed to Step 2. If you don't know if your userid has the MOUNT attribute, you probably don't so proceed to step 1.

STEP 1 Use this step if your TSO userid does not have MOUNT privileges and you are able to issue (or request to be issued) a command on a MVS system console to have a tape mounted. If your userid has MOUNT privileges, proceed to Step 2; otherwise proceed to Step 3.

If your TSO userid does not have the MOUNT attribute, you can still access a tape from TSO by having the operator issue a MOUNT command. You or the operator must mount and ready the tape on a free tape drive **BEFORE** issuing the following command on an MVS system console:

MOUNT *uuu*,VOL=(SL,FDR54T)

Change "uuu" to the actual tape unit address.

Change **FDR54T** to **FDR54R** if this is a production tape.

Now go to Step 2, but remember that when you are done with the tape, it must be unloaded by the MVS console command

UNLOAD *uuu*

Note: if the tape unit has a 4-digit address, you must precede the address with a slash on the MOUNT command, and may also do so on the UNLOAD command, e.g.,

MOUNT /1234,VOL=(SL,FDR54T) and **UNLOAD /1234**

STEP 2 Use this step if your TSO userid has the MOUNT attribute, or if you have completed Step 1.

If you are using ISPF, issue the following TSO commands from ISPF Option 6 (TSO COMMANDS). You can also exit ISPF and issue them from the TSO "READY" prompt.

Enter this TSO command to allocate the FDR distribution tape:

ALLOC DA('FDR.INSTALL') VOL(FDR54T) UNIT(*tape*) POS(9) SHR

Change "tape" to an appropriate tape unit name.

Change **FDR54T** to **FDR54R** if this is a production tape.

If you get the message "IKJ56221I DATA SET FDR.INSTALL NOT ALLOCATED, VOLUME NOT AVAILABLE", it may be because your userid does not have the MOUNT attribute; go back to Step 1. If you have already done Step 1, then the problem is that the tape was mounted AFTER the MOUNT command was issued. Issue an UNLOAD console command and go back to step 1.

Now issue this TSO command to invoke the Tape Install program:

LOADGO 'FDR.INSTALL'

The Tape Install program (FDRLOAD) will be loaded from the tape and begin execution. Proceed to Step 4.

380.01 CONTINUED . . .

STEP 3 Use this step to submit a batch job to copy the Tape Install program to a disk file, from which it can be executed under TSO.

Submit this jobstream:

```
//IEBGENER EXEC    PGM=IEBGENER
//SYSPRINT   DD     SYSOUT=*
//SYSIN      DD     DUMMY
//SYSUT2     DD     DISP=(,CATLG),SPACE=(1600,50,RLSE),
//          DSN=user-specified-name,       <=== specify a dataset name
//          UNIT=SYSALLDA,VOL=SER=vvvvvv   <=== specify a disk volume
//SYSUT1     DD     DISP=OLD,DSN=FDR.INSTALL,LABEL=(9,EXPDT=98000),
//          UNIT=TAPE,                     <=== change if required
//          VOL=SER=FDR54T                 <=== change to FDR54R if production tape
```

After the successful completion of the IEBGENER job, issue this TSO command from ISPF Option 6 (TSO COMMANDS) or the TSO READY prompt:

LOADGO '*user-specified-name*'
Specify the same data set name given in the JCL, in quotes.

The Tape Install program will be loaded from disk and begin execution. Proceed to Step 4.

STEP 4 The Tape Install program will prompt you for information on what, where and how to load the FDRPAS tape files, in a series of four user-friendly screens. No action will take place until you give the final confirmation on the fourth screen. Only then are the output data sets allocated and cataloged with the names you specified, and the loading of those data sets begins (either in the foreground or via a batch jobstream).

Note: all dataset names and index name references are specified and displayed as fully-qualified names: a TSO userid will **not** be prefixed to the names unless you key it in.

WARNING: If you are already a FDR customer, FDRPAS must be loaded in a separate set of libraries from your normal FDR libraries. If you put FDRPAS in a library with other FDR programs, neither may operate correctly. In this release, FDRPAS should not be put into the system linklist; always use a STEPLIB to execute FDRPAS.

380.01 CONTINUED . . .

SCREEN 1 – DATA SET SELECTION

```
WELCOME TO INNOVATION'S FDR TOTAL DASD MANAGEMENT SYSTEM INSTALLATION  SCREEN 1

PLEASE REPLY TO THE FOLLOWING PROMPTS. YOU WILL BE ABLE TO REVIEW AND
CHANGE YOUR SPECIFICATIONS PRIOR TO THE ACTUAL LOADING OF THE TAPE.

THE FOLLOWING DATA SETS MAY BE LOADED FROM THE INSTALLATION TAPE:

   1 - FDR INSTALLATION CONTROL LIBRARY
   2 - FDR LOAD MODULE LIBRARY
   3 - FDR ISPF DIALOG CLIST LIBRARY
   4 - FDR ISPF DIALOG PANEL LIBRARY
   5 - FDR ISPF DIALOG MESSAGES LIBRARY
   6 - FDR ISPF DIALOG SKELETON LIBRARY
   7 - FDR JCL LIBRARY
--------------------------------------------------------------------------------
<PRESS>  "ENTER"    -  SELECT ALL OF THE ABOVE DATA SETS AND CONTINUE
<TYPE>   "N,N,.."   -  SELECT THE SPECIFIED DATA SETS
<TYPE>   "END"      -  EXIT IMMEDIATELY
--------------------------------------------------------------------------------
            PLEASE SELECT ONE OF THE OPTIONS LISTED ABOVE
SELECT ===>
```

This screen allows you to select which of the data sets are to be loaded from the FDRPAS distribution tape. Normally, all data sets should be selected. When you are satisfied with the selection, press ENTER to continue to Screen 2.

380.01 CONTINUED . . .

SCREEN 2 – DATA SET NAME SELECTION

```
----------------------- DATA SET NAME SELECTION SCREEN -------------- SCREEN 2

PLEASE REVIEW THE SELECTED DATA SET NAMES AND MAKE THE DESIRED MODIFICATIONS.

  1 - INSTALL CONTROL..... IDP.ICLFDR54
  2 - LOAD LIBRARY........ IDP.MODFDR54
  3 - ISPF CLISTS......... IDP.DIALOG.CLIST
  4 - ISPF PANELS......... IDP.DIALOG.PANELS
  5 - ISPF MESSAGES....... IDP.DIALOG.MESSAGES
  6 - ISPF SKELETON....... IDP.DIALOG.SKELETON
  7 - JCL LIBRARY......... IDP.JCLFDR54


-------------------------------------------------------------------------------
<PRESS>  "ENTER"      -  USE THE ABOVE SPECIFICATIONS AND CONTINUE
<TYPE>   "ALL,INDEX"  -  ASSIGN NEW INDEX(ES) TO ALL DATA SET NAMES
<TYPE>   "N,NEWNAME"  -  ASSIGN A NEWNAME TO THE DATA SET DESIGNATED BY "N"
<TYPE>   "BACK"       -  GO BACK TO THE DATA SET SELECTION SCREEN 1
<TYPE>   "END"        -  EXIT IMMEDIATELY
-------------------------------------------------------------------------------
            PLEASE SELECT ONE OF THE OPTIONS LISTED ABOVE
SELECT ===>
```

This screen allows you to specify the data set names which will be used for the data sets you have selected to load from the tape. These may be existing data sets to be updated, or they may be new data sets which will be allocated and cataloged (new data sets are recommended). Do not install FDRPAS into existing libraries containing other FDR products, since they may share common modules.

The load library must be an APF authorized library. If necessary, you can authorize it after the install using the SETPROG console command (see the IBM "System Commands" manual for details).

The names shown above are the default names provided with the Tape Install program. You may change these names in one of 2 ways:

1) to change the current high-level index of all of the data sets to a different index (or indexes), enter "ALL,newindex(s)". For example,

   ALL,FDRPAS54 will change the names to FDRPAS54.ICLFDR54, etc.

   ALL,SYS3.FDRPAS will change the names to SYS3.FDRPAS.ICLFDR54, etc.

2) to completely change the name of any one data set, enter that data set's number followed by the replacement name. For example,

   3,SYS2.IDP.LOAD will change the name of the load library.

You can use either or both of these techniques repeatedly until you are satisfied with the names.

If you intend to update an existing library, be sure that library name is correctly specified. However, we recommend that you always install into newly created libraries to avoid X37 ABENDs due to insufficient space in existing libraries. For new data sets, the install program will allocate them with sufficient space.

Note: during the installation, the ISPF dialogs will be modified to use the data set names you specify here. If you later rename the FDRPAS libraries or copy the members to other libraries, you can update the dialogs with ISPF panel A.I.1A in the FDR manual, Volume 2.

380.01 CONTINUED . . .

SCREEN 3 – VOLUME SERIAL/SMS CLASS SELECTION

```
----------------------- VOLUME SERIAL SELECTION SCREEN ------------- SCREEN 3
THE FOLLOWING NEW DATA SETS WILL BE ALLOCATED AND CATALOGED:

                      DISP  VOLUME  DATA SET NAME
 1 - INSTALL CONTROL. NEW           IDP.ICLFDR54
 2 - LOAD LIBRARY.... NEW           IDP.MODFDR54
 3 - ISPF CLISTS..... NEW           IDP.DIALOG.CLIST
 4 - ISPF PANELS..... NEW           IDP.DIALOG.PANELS
 5 - ISPF MESSAGES... NEW           IDP.DIALOG.MESSAGES
 6 - ISPF SKELETON... NEW           IDP.DIALOG.SKELETON
 7 - JCL LIBRARY..... NEW           IDP.JCLFDR54
-------------------------------------------------------------------------------
<PRESS>  "ENTER"      -  USE THE ABOVE SPECIFICATIONS AND CONTINUE
<TYPE>   "ALL,VOLUME" -  ASSIGN A VOLUME TO ALL NEWLY ALLOCATED DATA SETS
<TYPE>   "N,VOLUME"   -  ASSIGN A VOLUME TO THE DATA SET DESIGNATED BY "N"
<TYPE>   "SMS"        -  DISPLAY SMS SPECIFICATIONS
<TYPE>   "BACK"       -  GO BACK TO THE DATA SET NAME SELECTION SCREEN 2
<TYPE>   "END"        -  EXIT IMMEDIATELY
-------------------------------------------------------------------------------
            PLEASE SELECT ONE OF THE OPTIONS LISTED ABOVE
SELECT ===>
```

On this screen, the DISP column shows whether the install program found that the indicated data set already exists (OLD) or does not exist (NEW). For NEW data sets, you can specify volume and/or SMS information to be used for the allocation of the data sets. For OLD datasets, the VOLUME column shows the volume serial of the existing data set.

Similar to Screen 2, you can specify the target disk volume serial for all or any one of the data sets to be allocated. For example,

ALL,SYSLB2 will change the target volume serial for all the data sets.

2,SYSVOL will change the target volume serial for the load library.

You can use either or both of these techniques repeatedly until you are satisfied with the names. The volume serial can be omitted if the data set will be SMS-managed or if your system will allocate such data sets on non-specific storage volumes.

If SMS is active on your system, you may enter "SMS" which will take you to variations of Screen 3 which will allow you to specify the SMS storage class, management class, and/or data class to be assigned to each data set. However, this is not necessary if your installation's SMS ACS routines will assign proper classes to these data sets.

380.01 CONTINUED . . .

SCREEN 4 – INSTALLATION PROCESSING OPTION

```
------------------- INSTALLATION PROCESSING OPTION SCREEN ----------- SCREEN 4

PLEASE VERIFY THE FOLLOWING SPECIFICATIONS AND SELECT THE PROCESSING OPTION:

                     DISP  VOLUME  DATA SET NAME
 1 - INSTALL CONTROL. NEW  SYSLB2  IDP.ICLFDR54
 2 - LOAD LIBRARY.... NEW  SYSLB2  IDP.MODFDR54
 3 - ISPF CLISTS..... NEW  SYSLB2  IDP.DIALOG.CLIST
 4 - ISPF PANELS..... NEW  SYSLB2  IDP.DIALOG.PANELS
 5 - ISPF MESSAGES... NEW  SYSLB2  IDP.DIALOG.MESSAGES
 6 - ISPF SKELETON... NEW  SYSLB2  IDP.DIALOG.SKELETON
 7 - JCL LIBRARY..... NEW  SYSLB2  IDP.JCLFDR54

-------------------------------------------------------------------------------
<TYPE>   "BG"       -  CREATE THE JCL TO LOAD THE ABOVE DATA SETS
<TYPE>   "BACK"     -  GO BACK TO THE DATA SET SELECTION SCREEN 1
<TYPE>   "END"      -  EXIT IMMEDIATELY
-------------------------------------------------------------------------------
            PLEASE SELECT ONE OF THE OPTIONS LISTED ABOVE
SELECT ===>
```

On this screen, you can review all of the decisions you have made before starting the actual loading of the libraries from the distribution tape. Entering "BACK" on this screen (or any of the others) will allow you to go back and change options before installation.

If **FG** (foreground) installation is chosen, all the data sets indicated as NEW will be allocated, then IEBCOPY or other utilities are invoked under TSO to load each of the selected libraries from tape. This option appears only if you loaded the Tape Install program directly from tape (Step 2). FG is recommended since the tape is already mounted.

If **BG** (background) installation is chosen, the NEW data sets will be allocated under TSO (same as FG) but then batch JCL will be created to actually load the libraries from the tape. This JCL will be stored as member **FDRLOAD** in the ICL (Installation Control Library) you specified, or, if you did not select the ICL, in a dataset named "**userid.FDRTEMP.JCL**". **You must review this jobstream, make any changes necessary for your installation, and submit it for execution.**

Notes:

a. If IEBCOPY gives a non-zero return code, it is considered to be a serious error.

b. If an ABEND Sx37 occurs, it is caused by lack of space in the disk data set. This should occur only when adding members to an existing data set since the libraries allocated by the Tape Install program should have sufficient space. Fix the offending data set either by compressing it, expanding its directory, allocating more space, moving to another volume or letting the Tape Install program create a new data set. LOGOFF and re-LOGON to free the existing allocations and restart the installation process.

c. While loading the FDRPAS CLIST library, the Tape Install program will update all references to the various FDRPAS libraries to the names you have specified here. When you use the newly loaded FDRPAS ISPF dialogs, all the proper library names will be preset for you.

380.02 INVOKING THE FDRPAS INSTALL ISPF DIALOG (PANEL A.I)

The FDRPAS CLIST Library contains a member named ABRALLOC for installation and testing of the new FDRPAS system. This CLIST invokes the FDRPAS ISPF dialogs by concatenating the FDRPAS ISPF libraries in front of your current ISPF library allocations. During the Tape Install process, the CLIST library was updated to reflect all of the FDRPAS library names to which you loaded the new FDRPAS version.

STEP 1 Issue the following command either under ISPF option 6 (TSO command processor), or under TSO "READY" mode:

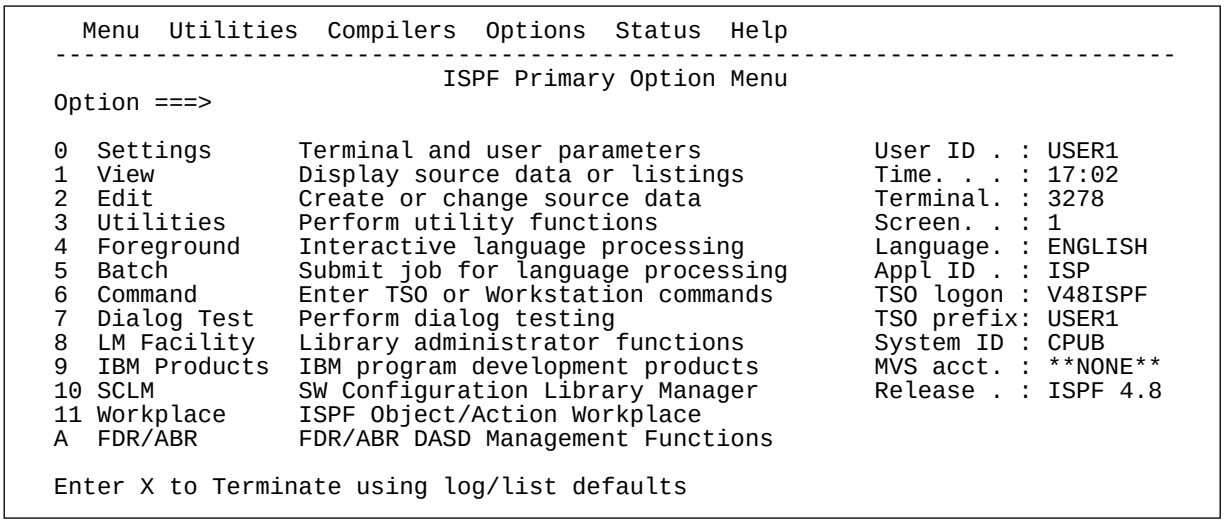
EXEC '*fdrpas.clist.library*(ABRALLOC)'

Use the data set name of the FDRPAS CLIST Library that was specified in the installation process.

This command will allocate the FDR ISPF dialog libraries. If you issue the command under ISPF, skip step 2 and proceed to step 3.

STEP 2 A standard ISPF primary menu for your version of ISPF, with the FDR/ABR option added, will be displayed. Select option "A" (FDR/ABR) on this menu to access the FDRPAS dialog.

ISPF PRIMARY OPTION MENU



```
  Menu  Utilities  Compilers  Options  Status  Help
--------------------------------------------------------------------------------
                           ISPF Primary Option Menu
Option ===>

0  Settings      Terminal and user parameters           User ID . : USER1
1  View          Display source data or listings        Time. . . : 17:02
2  Edit          Create or change source data           Terminal. : 3278
3  Utilities     Perform utility functions              Screen. . : 1
4  Foreground    Interactive language processing        Language. : ENGLISH
5  Batch         Submit job for language processing     Appl ID . : ISP
6  Command       Enter TSO or Workstation commands      TSO logon : V48ISPF
7  Dialog Test   Perform dialog testing                 TSO prefix: USER1
8  LM Facility   Library administrator functions        System ID : CPUB
9  IBM Products  IBM program development products       MVS acct. : **NONE**
10 SCLM          SW Configuration Library Manager       Release . : ISPF 4.8
11 Workplace     ISPF Object/Action Workplace
A  FDR/ABR       FDR/ABR DASD Management Functions

Enter X to Terminate using log/list defaults
```

380.02 CONTINUED . . .

STEP 3 Select option "I" (INSTALL) on the FDR Primary Options Menu to invoke the FDRPAS Install dialog, as illustrated in the following figure:

PANEL A: FDR PRIMARY OPTIONS MENU

```
---------- FDR TOTAL DASD MANAGEMENT SYSTEM -- FDR PRIMARY OPTIONS MENU ------
OPTION  ===>

   1  REPORTS     - ABR REPORTING FUNCTIONS
   2  RESTORE     - ABR DATA SET RESTORE
   3  ARCHIVE     - ABR DATA SET ARCHIVE OR SUPERSCRATCH
   4  BACKUP      - ABR DATA SET BACKUP
   5  REMOTE Q    - ABR REMOTE QUEUE UTILITY FUNCTIONS

   C  COMPAKTOR   - COMPAKTOR MAP AND SIMULATION REPORTS
   R  RELEASE     - COMPAKTOR RELEASE

   I  INSTALL     - INSTALLATION AND MAINTENANCE OF FDR AND OPTIONAL PRODUCTS
   J  JCL PARMS   - SPECIFY FDR JCL AND SYSOUT DEFAULTS FOR SUBMITTED JOBS
   K  FORMAT      - MODIFY FORMAT OF GENERATED REPORTS

   M  MESSAGES    - FDR MESSAGES AND CODES QUERY FACILITY
   P  PLUG & SWAP - FDRPAS PLUG & SWAP
   Q  QUERY       - FDR/ABR STATISTICS QUERY

   S  SRS         - SEARCH, REPORT, SERVICES DIALOG

   T  FDRTSEL     - BACKUP FILE MANAGEMENT UTILITY
```

The FDRPAS Install dialog includes options that are used during the installation and customization of other FDR programs, such as FDR, FDRABR, FDRREORG, and COMPAKTOR. Some of these options also apply to FDRPAS and are documented in this manual. Others do not apply; they are not shown in this manual and should not be used.

380.03 SELECT THE FDRPAS GLOBAL OPTIONS (PANEL A.I.4)

NEW INSTALLATIONS: You will want to display each of the option panels that apply to FDRPAS to review and set options appropriately. Innovation suggests that you review the text in the following sections of the manual as you go through this process, but you may also display the help panels for any option panel, with much of the same information.

EXISTING INSTALLATIONS: You can copy the options and tables from your production version of FDRPAS, but you may wish to review the option panels afterwards to be sure that any new options and options for new FDRPAS components are properly set.

Many options which affect the FDRPAS system may be changed permanently. Most such options are kept in a load module called FDROPT, in the FDRPAS program library.

There are two ways of modifying these options and tables. The FDRPAS ISPF dialogs may be used to set all options and tables. This is the preferred way, since all options are displayed with online help to describe them. If you have not installed the dialogs or prefer not to use them, the options and tables may be set with program FDRZAPOP, the Global Option Change facility, described in Section 91 in the FDR manual.

380.03 CONTINUED . . .

To enter the FDR dialog to display and set options in FDROPT, select option "4" (SETOPT) in the FDR Installation Options Menu, as illustrated in the following figure:

PANEL A.I: FDR INSTALLATION MENU

```
---------- FDR TOTAL DASD MANAGEMENT SYSTEM -- INSTALLATION OPTIONS MENU -----
OPTION  ===>

   1  INSTALL  - LOAD SELECTED LIBRARIES FROM THE FDR DISTRIBUTION TAPE
   1A DSNAMES  - DISPLAY/CHANGE THE DATA SET NAMES OF THE FDR LIBRARIES
   2  LOADSAR  - LOAD THE STAND-ALONE PROGRAM (SAR) ONTO DISK

   4  SETOPT   - SET INSTALLATION OPTIONS IN THE FDR GLOBAL OPTIONS TABLE
   4A DYNAM    - DISPLAY THE DYNAMICALLY INSTALLED FDR GLOBAL OPTIONS TABLE

   5  SETCPK   - SET UP THE COMPAKTOR UNMOVABLE TABLE
   5A SETREORG - SET UP THE FDRREORG NOREORG LIST

   ABR OPTION INSTALLATION

   6  SETLIST  - SET UP THE ABR PROTECT LISTS AND RESTORE ALLOCATION LIST
   7  ABRCAT   - CREATE THE ABR CATALOG
   8  ABRVOL   - SET ABR DISK VOLUME PROCESSING OPTIONS
   9  BLDARC   - CREATE THE ARCHIVE CONTROL FILE
  10  DIALOG   - SET FDR DIALOG GLOBAL OPTIONS

  11  ADDISPF  - ADD FDR COMMANDS TO AN ISPF COMMAND TABLE
```

FDRPAS GLOBAL OPTIONS

The FDRPAS Global Options Table (module FDROPT) contains installation options for security features, user exits, control statement defaults, etc. Options are organized by option type on the Global Options Primary Menu; each option on this panel takes you to another panel where you may display and modify the actual options.

PANEL A.I.4: SET GLOBAL OPTIONS

```
---------- FDR INSTALLATION -- SET FDR GLOBAL OPTIONS PRIMARY MENU ------------
OPTION  ===>
PLEASE ENTER OPTION NUMBER OR COMMAND
    1  - SECURITY OPTIONS                 8  - MORE ABR GENERAL OPTIONS
    2  - GENERAL OPTIONS                  9  - ABR REPORT DEFAULTS
    3  - COMPAKTOR OPTIONS               10  - MORE ABR REPORT DEFAULTS
    4  - ABR GENERAL OPTIONS             11  - OPERATING SYSTEM EXITS
    5  - ABR DATA SET NAMES              12  - FDRREORG OPTIONS
    6  - ABR ARCHIVE UTILITY DEFAULTS    13  - RESERVED
    7  - ABR DISK PROCESSING OPTIONS     14  - FDRPAS OPTIONS

  SAVE - SAVE OPTION CHANGES            COPY - COPY OPTIONS FROM A PRIOR LEVEL
CANCEL - EXIT WITHOUT SAVING CHANGES   AUDIT - DISPLAY USER CHANGED OPTIONS
EFRESH - REFRESH OPTIONS TABLE IN LPA  RESET - RE-INITIALIZE ALL OPTIONS

FDR PROGRAM LIBRARY DATA SET:
  DATA SET NAME    ===> 'IDP.MODFDR54'
  VOLUME SERIAL    ===>

NOTE: TO REFRESH THE OPTIONS THAT ARE DYNAMICALLY INSTALLED IN THE ACTIVE LPA,
IT IS NECESSARY TO RUN FDRSTART - USE THE REFRESH CMD TO GENERATE FDRSTART JCL.
```

The name of the FDRPAS program library used during installation will be displayed. If necessary, correct that library name; you can also specify the volume serial of the library if it is not cataloged. These values will be saved in your ISPF profile so that you do not need to reenter them in the future. The subsequent panels will display the options currently in effect in the FDROPT module in that library, and will update that library when the options are saved.

380.03 CONTINUED . . .

SET OPTION COMMANDS

As shown, several special commands are available on this panel:

SAVE updates the FDROPT module in the specified program library. No changes are made to the library until SAVE is entered, so you may freely switch between option panels and change options until you are satisfied.

CANCEL exits to the previous menu and discards all options changed since the last SAVE command.

REFRESH is not used with FDRPAS.

COPY is used to copy options and tables from a previous release of FDRPAS (see next page).

AUDIT will display the values and descriptions of all options which are not currently set to the Innovation default, i.e., an audit of all changed options.

RESET resets all options to the default values distributed by Innovation.

Warning: RESET should be used with care since it does reset all options to their defaults. This is especially dangerous for existing customers, since this may change the operation of FDRPAS. We suggest that you use the AUDIT function (above) to document options not set to the default before using RESET.

SAVE and CANCEL can be used on any of the option panels. Other commands are only valid on this panel. If an option value is changed since the last SAVE command and you attempt to exit from this panel, you will be prompted to SAVE or CANCEL the changes before exiting.

380.03 CONTINUED . . .

NEW INSTALLATIONS

Innovation suggests that **new installations** should display each documented option panel and review the options on them.

Currently the only option panels used with FDRPAS are:

1 - Security Options

14 - FDRPAS options

EXISTING INSTALLATIONS

The COPY command on the FDRPAS Global Options Panel (A.I.4) can be used to copy the option values set in a previous version of FDRPAS by reading the FDROPT module from the previous load library and setting the equivalent options in the new FDROPT.

Warning: Do not copy the FDROPT module from a previous version of FDRPAS using any standard copy utility (such as IEBCOPY or ISPF COPY); the dialog COPY function copies option values while preserving version information and new defaults in the new FDROPT.

```
---------- FDR INSTALLATION -- COPY FDR GLOBAL OPTIONS -----------------------
COMMAND ===>

COPY "TO" DATA SET:  'IDP.MODFDR54'

TO CANCEL THE COPY OPERATION, EITHER PRESS THE END KEY (PF3) OR TYPE "CANCEL".

SPECIFY "FROM" DATA SET BELOW.

FDR PROGRAM LIBRARY DATA SET:
  DATA SET NAME    ===> 'IDP.MODFDR53'
  VOLUME SERIAL    ===>

IN ADDITION, COPY THE FOLLOWING OPTIONS MODULES:

  ALLOCATE - ABR RESTORE ALLOCATION LIST... ===> YES   (YES NO)
  ARCPROT  - ABR ARCHIVE PROTECT LIST...... ===> NO    (YES NO)
  ABRPROT  - ABR BACKUP  PROTECT LIST...... ===> NO    (YES NO)
  RESTPROT - ABR RESTORE PROTECT LIST...... ===> NO    (YES NO)
  SCRPROT  - ABR SCRATCH PROTECT LIST...... ===> NO    (YES NO)
  CPKUNMOV - COMPAKTOR UNMOVABLE TABLE..... ===> NO    (YES NO)
  FDRNORG  - FDRREORG NOREORG LIST......... ===> NO    (YES NO)
```

Enter the data set name (and optional volume serial) of the FDRPAS program library containing the previous version of FDRPAS. Only those options which are not set to the Innovation default in effect for that version are copied; this way, if the Innovation default for an option is changed in the new version, the new default will not be overridden with the old default. The option values copied are immediately saved in the "to" program library; no SAVE command is required.

The options modules listed at the bottom of the screen are not used with FDRPAS.

380.04 SECURITY OPTIONS (PANEL A.I.4.1)

FDRPAS, as a default, will not invoke any type of security on individual volumes or data sets. Since FDRPAS does not open individual datasets, security checks will be bypassed for FDRPAS operations unless you enable the ALLCALL security option documented below**. By default, ALLCALL is disabled; however, FACILITY class security checks are always done.**

PANEL A.I.4.1: SECURITY OPTIONS

```
---------- FDR INSTALLATION -- SET FDR GLOBAL SECURITY OPTIONS ------------
COMMAND ===>

ALLCALL   RACF ALWAYS CALL OPTION ENABLED.......................... NO

NOABSTRK  ABSOLUTE TRACK OPERATIONS ALLOWED........................ YES

NONEW     RENAME USING NEWDD, NEWNAME, NEWINDEX AND NEWGROUP ALLOWED. YES
```

ALLCALL If set to YES, FDRPAS does SAF-compatible security checks for volumes to be swapped. ALLCALL is set to NO (disabled) by default.

ALLCALL causes a SAF call in the form of RACROUTE REQUEST=AUTH to be used for volume-level protection. For FDRPAS, the user must have authority in class DASDVOL to the volser of the online volume being swapped. For a SWAP or SWAPBULIDIX operation, ALTER authority is required, while a SWAPDUMP operation requires READ authority. If the user does not have the appropriate authority, the operation is terminated.

If the DASDVOL profile is not defined for the volume, then FDRPAS will check for the appropriate authority to every data set on the volume, in the DATASET class. This can be time-consuming and may cause swap failures if the user does not have sufficient authority, so the ALLCALL option is not recommended unless the volumes to be swapped are protected by DASDVOL profiles.

FDRPAS also issues SAF calls to verify that the user has at least READ authority to a resource in the FACILITY class. The resource names are:

FDRPAS.SWAP	for SWAP operations
FDRPAS.SWAPDUMP	for SWAPDUMP operations
FDRPAS.SWAPBUILDIX	for SWAPBUILDIX operations

This allows your installation to restrict any or all FDRPAS operations to certain users. If the appropriate resource name is not protected, the operation will continue. These FACILITY checks are always done, even if ALLCALL is not enabled. If you do not have an active security system, SAF will indicate that the resource is not protected.

NOABSTRK Not used with FDRPAS

NONEW Not used with FDRPAS

380.05 FDRPAS OPTIONS (PANEL A.I.4.14)

PANEL A.I.4.14: FDRPAS OPTIONS

```
---------- FDR INSTALLATION -- SET FDR GLOBAL PLUG & SWAP OPTIONS  -----------
COMMAND ===>


PASPROC   NAME OF CATALOGED PROCEDURE USED FOR PLUG & SWAP.......... PASPROC

PASINDEX  HIGH LEVEL INDEX FOR FDRPAS CATALOG ENTRIES.............. FDRPAS
```

PASPROC FDRPAS requires that you install a cataloged procedure (PROC) for FDRPAS in an appropriate JES procedure library. This proc will be used when a FDRPAS monitor task has to dynamically invoke another monitor task to handle the swap of a specific volume. It can also be used in user-created FDRPAS batch jobs and to start FDRPAS started procedures from the console with START (S) commands.

The default procedure name is PASPROC. If you install this procedure with a different name, you must change it here.

The model for this procedure is found in the FDRPAS ICL (Installation Control Library) under member name PASPROC. It looks like:

```
//PASPROC   PROC PROG=FDRPAS
//              EMAIL=NULLFILE,   EMAIL STATEMENT INPUT DATA SET
//              IN=NULLFILE,      FDRPAS STATEMENT INPUT DATA SET
//              D=SHR             INPUT DATASET DISPOSITION
//PAS       EXEC PGM=&PROG, REGION=0M
//*********************************************************************
//*  FDR PLUG AND SWAP                                                *
//*********************************************************************
//STEPLIB   DD   DISP=SHR,DSN=library          <<== CHG DSN
//SYSPRINT  DD   SYSOUT=X
//SYSUDUMP  DD   SYSOUT=X
//FDREMAIL  DD   DSN=&EMAIL,DISP=SHR
//SYSIN     DD   DSN=&IN,DISP=&D
```

You must change the name of the STEPLIB to the FDRPAS load library you specified during installation. If SYSOUT class X is not a held class in your system, you may want to change it to a held class.

Security Note: if you have restricted access to the FDRPAS program library or enabled the FDRPAS ALLCALL security option, you may need to assign an appropriate security userid to started tasks which use PASPROC. Consult the documentation for your security product for details.

PASINDEX FDRPAS uses the PASINDEX value as the high-level index of data set names it catalogs to create history records for FDRPAS SWAP operations. Only catalog entries will be created with this name; FDRPAS will not create any real data sets using this high-level index. This name should be defined in the master catalog of every system on which FDRPAS will run, as an alias of a user catalog into which these FDRPAS catalog entries will be placed. If possible, this user catalog should be a shared catalog accessible to every system, but if this is not possible, it can point to different user catalogs on different systems.

The FDRPAS swap and monitor tasks must have authority to catalog data sets beginning with the PASINDEX into the aliased user catalog. If they do not, the history records will not be created but the swaps will run successfully.

You may change PASINDEX to any valid high-level index.

Here is an example of the IDCAMS input necessary to assign FDRPAS (or whatever value you assign to PASINDEX) as an alias of an existing ICF catalog (the IDCAMS job must be authorized to update the master catalog):

```
DEFINE ALIAS(NAME(FDRPAS) RELATE(CATALOG.MISC))
```

380.06 AUTHORIZING FDRPAS PROGRAMS

AUTHORIZING THE FDRPAS PROGRAM LIBRARY

FDRPAS must execute as an APF-authorized program on all systems involved (both swap tasks and monitor tasks must run as authorized tasks).

If your installation has a dynamic authorized program library list (APF list), then you can authorize the FDRPAS program library temporarily (until the next IPL) by using the console command:

```
SETPROG APF,ADD,DSNAME=fdrpas.load.library,VOL=volser
```

If your APF list is not dynamic, then you must update the PROGxx member of PARMLIB with the FDRPAS library name and volser, and issue the console command:

```
SET PROG=xx
```

If you expect to continue to use FDRPAS beyond the next IPL, then you should update the PROGxx member even if you have used SETPROG to authorize it.

AUTHORIZING THE FDRPAS ISPF PROGRAM

Before the FDRPAS ISPF dialogs can be used on a given system, you must add program FDRPASA to the list of TSO authorized programs on that system and you may need to update ACF2 if you are using that security system.

TSO programs are authorized by modifying member IKJTSOxx in SYS1.PARMLIB. Program name FDRPASA must be added to both the AUTHPGM and AUTHTSF lists in that member. If you have the proper authority, you may issue the TSO command:

```
PARMLIB UPDATE(xx)
```

to activate the updated IKJTSOxx member immediately; otherwise it will be activated after the next IPL. Once it has been activated, you can use the FDRPAS ISPF interface.

ACF2 COMMAND LIMITING FACILITY

If you are using the ACF2 Command Limiting Facility to limit the use of TSO command processors, you must add FDRPASA and FDRPASIS to the list of authorized commands for any user who will use the FDRPAS ISPF dialogs.

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390.01 INTRODUCTION TO MESSAGES

This section describes the various printer and console messages which may be output by FDRPAS and the various ABEND codes with which FDRPAS may terminate.

FDR MESSAGE FORMAT

messages from all components of FDR have this format:

FDR*nnn message-text*

where "nnn" is a 3-digit message number. When FDRnnn is followed by ****** (2 asterisks) the message usually indicates some sort of error, which may result in an ABEND or a non-zero return code. Messages without the asterisks are usually informational.

messages directed specifically to the MVS console or TSO user will have this format:

FDRW*nn message-text*

Some of these messages require replies by the MVS operator or TSO user. However, other FDRnnn messages may also be sent to the MVS console.

Many FDRPAS messages contain a "system ID" or "sysid", used to identify systems in a multi-system environment. The system ID displayed is taken from field CVTSNAME in the CVT (Communication Vector Table) of each system.

RETURN CODES

FDR programs set a return code at the end of the step, unless they ABEND:

0 - normal completion

32 - a trial version of an FDR product has reached the end of its trial period and will no longer function. If you have licensed a production version of the product you should install it. Contact Innovation.

Any other return code - errors of some kind have occurred during this execution. Check the listing for the error messages. This usually indicates that errors occurred which were not severe enough to terminate the operation, yet the program wanted to call attention to the error messages at the end of processing. Severe errors usually result in an immediate ABEND.

ABEND CODES

FDR user ABEND codes range from U0100 to U0999 and are documented in Section 390.04. Most user ABENDs are preceded by an FDR error message.

Note that user ABEND U0888 is a special case. It is issued by FDR programs to indicate that errors occurred which were not severe enough to terminate the FDR operation, yet FDR wanted to call attention to the error messages at the end of processing. Severe errors usually result in an immediate ABEND.

390.01 CONTINUED . . .

MINI-DUMP In many cases, an error message will be followed by a set of diagnostic displays, called an FDR mini-dump and it is identified by messages beginning with FDR09x. The mini-dump includes:

- the general registers at the time of the mini-dump. These may or may not be significant, depending on the error.
- blocks of storage identified by the FDR program requesting the mini-dump. These usually have a title above them for identification. The storage displayed varies depending on the error message.
- for certain I/O errors, it will display the DCB, UCB, and IOB. The IOB contains:

bytes 2-3	sense bytes 0-1
byte 4	I/O termination post code (7F = normal termination)
bytes 8-15	hardware-generated CSW (channel status word, see the IBM *Principles of Operation* manual), consisting of:
bytes 8-11	address of last CCW executed +8
bytes 12-13	channel status flags
bytes 14-15	remaining length in last CCW (CCW length field minus this gives bytes transferred)

- It will also format the CCW chain executed. CCW(-0) identifies the last CCW executed.

I/O ERRORS AND TRACES For most I/O errors, FDR will format information about the error in a condensed format that includes:

- the IOB (I/O request block) as described above.
- The CCW chain (4 CCWs per line in most cases)
- Up to 8 bytes of data associated with each CCW (16 or 20 bytes for certain CCWs). The lines containing the data will alternate with the lines containing the CCWs, so that the data for each CCW is immediately below the CCW itself.

Innovation technical support may request that you add operands to your control statements which will trace all I/Os issued by FDR. This same format is used for those traces.

390.02 FDR CONSOLE MESSAGES

The following write-to-operator (WTO) and write-to-operator-with-reply (WTOR) are issued by FDR:

FDRW01 CONFIRM REQUEST TO *function* VOL=*vvvvvv* TO UNIT=*uuuu* ON *nnn* SYSTEMS REPLY YES OR NO

Reason: FDRPAS has been requested to process volume vvvvvv to offline target device uuuu and CONFMESS=YES was specified. nnn system images are participating in the function. "function" will be SWAP for a SWAP function or DUMP for a SWAPDUMP function. If you are using the FDRPAS ISPF panels to monitor active swaps, this message will also appear on the ISPF display; you can reply to it from ISPF or from the operator console.

Action: Reply YES-Operator approves request.

Reply NO-Operator does not approve the request; the function is terminated. Message FDR234 REASON=Q will be printed.

To perform SWAP or SWAPDUMP without operator intervention, specify CONFMESS=NO on the SWAP statement or omit CONFMESS= (NO is the default).

FDRW60 FDROPSPF VER *x.x/xx* - PROCESSING ERROR - PARM-LVL *level*

Reason: The FDR Install dialog CLIST invoked program FDROPSPF with an incompatible parameter level, indicating that the DDNAME allocations for the FDR CLIST library and the FDR program library point to libraries at different maintenance levels. On a re-install, the problem might be that the new FDR program library is not allocated to either ISPLLIB or STEPLIB DDNAMEs, thus causing the prior level FDR programs to be loaded from the Linklist.

Action: Use the ABRALLOC CLIST supplied by Innovation, as documented in Section 380.02.

FDRW66 *function* OF VOL=*vvvvvv* TO UNIT=*uuuu* STARTED ON *nnn* SYSTEMS (*sysid1 sysid2 ...*)

Reason: FDRPAS has begun to process volume vvvvvv to offline unit uuuu. nnn systems (1-128) systems are participating in the function. The system names of the participating systems are listed (if all system names cannot fit in one message, additional FDRW66 messages with only the additional system names are issued). "function" will be SWAP for a SWAP function or DUMP for a SWAPDUMP function.

function OF VOL=*vvvvvv* TO UNIT=*uuuu* CONTINUES WITH OVERRIDE OF WARNINGS

Reason: This form of the FDRW66 message occurs when the swap has been allowed to continue despite warning messages. For example, the operator has replied YES to theFDRW68 message shown below, to document that the operator has approved continuing with the swap despite the warning that an apparent insufficient number of systems are participating, or you specified LARGERSIZE=OK to allow a swap to a larger disk. "function" will be SWAP for a SWAP function or DUMP for a SWAPDUMP function.

SWAP OF VOL=*vvvvvv* TO UNIT=*uuuu* NEEDS TO BE STARTED ON *nnn* SYSTEMS

Reason: This form of the FDRW66 message occurs for a SIMSWAP operation and appears only in the printout, not on the console. It indicates that FDRPAS has determined that the volume “vvvvvv” is attached to “nnn” systems (not including systems for which EXCLUDE statements were present) and a monitor task should be running on those systems. If FDRPAS was unable to determine the number of systems, “nnn” is the value you specified for #SYSTEMS=nnn.

390.02 CONTINUED . . .

FDRW68 CAUTION REQUEST TO SWAP VOL=vvvvvv TO UNIT=uuuu ON nnn SYSTEMS IGNORING NON-RESPONDING CPUS REPLY YES, NO OR RETRY

Reason: FDRPAS has been requested to process volume 'vvvvvv' to offline target device 'uuuu'. 'nnn' system images have indicated that they will participate in the function within a time limit imposed by FDRPAS, but FDRPAS expected that a larger number of systems would participate. This message may occur:

- if you have systems which are not running MVS-type operating systems or which are not active; see "Multi-System Determination" in Section 320.01 for details
- if you have not started a FDRPAS monitor task on all system images
- if the target device is online to some systems (see message FDR235 in the monitor task listings)
- if the monitor tasks are not monitoring the proper target device(s)
- if some monitor tasks have failed.
- if the monitor tasks have a low dispatching priority on a busy system, or the LPAR running the monitor task has a low priority; you will probably need to increase the task or LPAR priority to get a successful swap.

Message FDR234 REASON=M may also be displayed on the console to identify the non-responding systems. See the topic "System Determination" in Section 300.04 for an explanation of FDRPAS multi-system operation and the determination of the number of systems.

Also see the #SYSTEMS= and MIN#SYSTEMS=parameters in Section 310.02. If you are using the FDRPAS ISPF panels to monitor active swaps, this message will also appear on the ISPF display; you can reply to it from ISPF or from the operator console.

Action: Reply YES - if you want the swap to continue. This should be done only if you are sure that the additional system images do not have the source volume online; Innovation suggests that you use console commands on every system to verify how many have the volume online. If in doubt, reply NO until the condition can be investigated and corrected if necessary.

Reply NO - terminate the swap request. Message FDR234 REASON=Q will be printed.

Reply RETRY - FDRPAS will wait additional time to see if the additional systems indicate their participation. If you did not start FDRPAS monitor tasks on all systems, start them before replying. If sufficient additional systems do not participate, the message will be reissued.

Under no circumstances should you automate the reply to this message. Every occurrence of the message must be investigated by a real person before replying.

FDRW89 FDR - TRIAL VERSION FROM INNOVATION DATA PROCESSING EXPIRES IN *nnn* DAYS

Reason: This is a trial version of FDRPAS. The number of days the trial will remain active is displayed. When there are 10 or fewer days before the trial is due to expire this message will become non-deletable.

Action: When the trial expires it will not be usable. If you have licensed a production version of FDRPAS, you should install it in place of the trial version. Call Innovation if you need assistance.

390.03 MESSAGES FROM FDR

FDR001 *program/function* – VER *v.r/mmt* – INNOVATION DATA PROCESSING DATE=yyyy.ddd PAGE nnn

Reason: This is the FDR page heading, containing the name of program or FDR function generating the message and the version level of FDR. "v.r" indicates the version and release (e.g., 5.4), "mm" is a 2-digit number indicating the maintenance level and "t" will be "P" for a production version or "T" for a trial.

FDR003 NONSTANDARD RECORD ZERO – *cccchhhhrrkkllll – function* CONTINUING

Reason: FDRPAS detected a non-standard record zero (R0) in a track on the volume. The count field of the R0 is printed in hex. A standard IBM record zero format has an rrkkllll field of 00000008 – that is, record number zero, key length zero, and data length eight.

Action: FDRPAS will continue copying data, to detect additional errors, but will not complete the swap. If necessary, contact Innovation for assistance in correcting the error.

FDR007 *startend* TIME OF *function – hh.mm.ss* - UNIT=*disktype*, IN=*inputdd* ,OUTPUT=*outdd*

Reason: Documents the time that FDRPAS began or ended a swap. "startend" will be STARTING or ENDING. "function" will indicate the type of function (e.g., FULL VOL SWAP). "inputdd" is the input DD name, "outdd" is the output DD name (always TAPE1) and "disktype" identifies the input or output disk device type (in the case of emulated disk, such as RAMAC, the emulated disk type, such as 3390, will be shown.

FDR008 OPEN ERROR OR NO DD STATEMENT DD=*ddname - function* BYPASSED

Reason: 1. A required disk or tape DD statement specified by "ddname" was missing.

2. DDname SYSPRINx is missing.

3. An error occurred while OPENing the specified "ddname".

Action: The disk in error will be bypassed. See the joblog for possible IBM OPEN error messages.

FDR019 RACF FACILITY PROTECTION FOR BYPASS FAILED FOR *resource*

Reason: FDRPAS always issues a RACROUTE call to check for READ authority to resources in the FACILITY class, which you may use to control which users can do FDRPAS operations. The resources are:

FDRPAS.SWAP (for SWAP)
FDRPAS.SWAPDUMP (for SWAPDUMP)
or FDRPAS.SWAPBUILDIX (for SWAPBUILDIX)

However, the user running FDRPAS was not authorized to the appropriate resource.

Action: A control statement error is issued and the operation fails.

390.03 CONTINUED . . .

FDR020 RACF VOLUME PROTECTION FAILED ON VOL=*vvvvvv*

Reason: Security checking was enabled in the FDR Global Option Table (the ALL CALL option). A security call for class DASDVOL and volume "vvvvvv" failed. The user does not have sufficient authority to perform this swap.

Action: A U0801 Abend is issued.

FDR021 RACF DATASET PROTECTION FAILED ON DSN=*dsname*

Reason: Security checking was enabled in the FDR Global Option Table (the ALLCALL option). A security call for class DASDVOL and volume "vvvvvv" indicated that the volume was not protected by DASDVOL, so FDRPAS began doing checks in class DATASET for all data sets on the volume. The user does not have sufficient authority to the data set named, so the FDRPAS operation was terminated.

Action: A U0801 Abend is issued.

FDR023 DUMMY VTOC READ – ENTIRE PACK WILL BE DUMPED

Reason: FDRPAS found that the VTOC on this volume started and ended on cylinder zero head zero. This is the format used on volumes initialized by VM; that dummy VTOC is not valid.

Action: FDRPAS will copy all tracks on the volume.

FDR024 INVALID EXTENT DESCRIPTOR [REASON=*reason* DSN=*dsname*]

Reason: FDR read a DSCB (Format 1 or 3) which contained an invalid extent description. If a minidump is printed, the first five bytes of the DSCB printed after the registers in the minidump are the cylinder, head, and record number (CCHHR) of the DSCB in error. If REASON= is printed, it is one of the following:

1 - ENDING CYLINDER TOO LARGE

2 - STARTING TRACK TOO LARGE

3 - ENDING CCHH BEFORE BEGIN

4 - ENDING TRACK TOO LARGE

Note: Reasons **2** and **4** indicate that the starting or ending track number of an extent is higher than the highest track on a cylinder, i.e. higher than 14 on 3380 or 3390; not that the start or end of an extent is after the end of the pack.

Action: FDRPAS will terminate the swap. You must correct the VTOC error or delete the identified data set before attempting to swap the volume again. If necessary, contact Innovation for assistance.

390.03 CONTINUED . . .

FDR102 PROGRAM IS NOT APF AUTHORIZED

Reason: Most FDR programs must be executed as an APF-authorized program in order to execute correctly. This program detected that it was not executing authorized. This most often occurs when you are testing a new version of FDR with a STEPLIB which has not been authorized.

Action: Authorize the library from which you executing FDRPAS. You can update a library list in SYS1.PARMLIB and you may be able to input a console command which will authorize the library.

Contact Innovation if you need assistance.

FDR107 *function* SUCCESSFULLY COMPLETED VOL=*vvvvvv*

Reason: The indicated function was successfully completed on the disk volume "vvvvvv".

FDR122 OPERATION STATISTICS FOR *type* VOLUME...*volser*

Reason: This is the header for a table of statistics about the FDRPAS copy operation that was performed on the volume indicated. These statistics include all tracks copied and re-copied in all passes of Phase 3, so the byte and track counts may be higher than the actual number of tracks or bytes copied.

CYLINDERS ON VOLUME - total number of data cylinders on volume being processed

DATASETS PROCESSED – number of data sets on the volume.

BYTES READ FROM DASD - total number of bytes actually copied up from the volume

DASD TRACKS SWAPPED - number of data tracks copied.

UPDATED TRACKS RECOPIED - number of data tracks re-copied due to updates.

DASD EXCPS - number of read I/O requests issued to the source volume.

TARGET DASD EXCPS - number of write I/O requests issued to the target device.

CPU TIME (SECONDS) - the CPU (TCB) time required to process this volume, in seconds and thousandths of a second.

ELAPSED TIME (MINUTES) - the actual time, in minutes and tenths, required to process this volume.

SWAP TIME - the actual time, in minutes and tenths, required to swap this volume (excluding initialization).

390.03 CONTINUED . . .

FDR124 FORMAT 4 ERROR REASON=*reason*

Reason: FDRPAS detected a problem with the Format 4 DSCB or label track on a source volume. The Format 4 DSCB describes the VTOC itself. The VTOC may be improperly formatted.

"reason" may be:

1 - MORE THAN ONE FORMAT 4 - more than one Format 4 DSCB was found, or the first DSCB in the VTOC was not a Format 4. This may be due to an IBM problem.

2 - COMPAKTOR FAILURE ON VOL - COMPAKTOR was executed against the volume but it did not complete.

3 - LABEL TRACK IS INVALID - the label track (cylinder 0 track 0) does not contain a properly formatted volume label.

Action: FDRPAS will terminate the swap. You must correct the error before you attempt to re-execute the swap. List the VTOC in hex with

```
//LIST     EXEC   PGM=IEHLIST
//SYSPRINT  DD    SYSOUT=*
//DISK1     DD    UNIT=3390,VOL=SER=vvvvvv,DISP=OLD
   LISTVTOC  VOL=3390=vvvvvv,DUMP
```

and contact Innovation for assistance.

FDR125 I/O ERROR READING THE VTOC *X'ccchhhh'* VOL=*vvvvvv*
ENTIRE PACK WILL BE DUMPED

Reason: FDRPAS detected an I/O error reading the VTOC on the cylinder and track indicated in hex. An I/O trace message will also be printed to document the error.

Action: Since FDRPAS cannot determine the data sets on the volume, all tracks on the source volume will be copied to the target device. However, if the I/O error repeats when FDRPAS is trying to copy the VTOC track to the target device, the swap will be terminated.

FDR126 VTOC/DSCB ERROR REASON=*reason*

Reason: While analyzing the DSCBs in the VTOC, FDRPAS found an invalid DSCB or another VTOC-related error occurred. "reason" describes the error.

Action: For most errors, FDRPAS will continue processing the volume, in order to detect additional errors. However, the swap will not be performed. Certain errors will cause immediate termination.

FDR128 INVALID RECORD ZERO ON TRACK X'*ccchhhh*' DATA X'*ccchhhh*'

Reason: The track specified has an invalid record zero (R0). The count field of R0 should always contain the ID of the track it resides on. The cylinder and track (in hex) of the failing track is displayed, along with the count field of R0.

Action: FDRPAS will continue copying data, to detect additional errors, but will not complete the swap. If necessary, contact Innovation for assistance in correcting the error.

390.03 CONTINUED . . .

FDR129 I/O ERROR ON DISK PACK–LAST SEEK ADDRESS READ X'*ccccchhhh*'

Reason: An I/O error was detected by FDRPAS on this source volume or target device. The cylinder and track (in hex) printed may not be accurate. An IBM IOS000I message may also have been printed on the Job log.

Action: FDR149 I/O trace messages are printed to detail the error. FDRPAS will terminate the swap.

FDR130 CYL=*ccccc* HEAD *xxx...x* WAS COPIED

Reason: Internal message showing on each cylinder and track (head) copied; it appears only if PRINT=ALL is specified on the SWAT statement. An X appears for each track copied within the cylinder. "ccccc" is the cylinder number in decimal.

FDR149 tracedata

Reason: Displays data from an internal trace. The FDR operands to invoke various traces will be provided by Innovation when the data is required to diagnose a problem you have reported. The message is also sometimes used when I/O errors occur. It is also used by a FDRPAS monitor task to document I/O chains encountered that could not be interpreted.

FDR158 DATA SET ENQ FAILED DSN=*dsname*

Reason: FDRPAS has found that the data set named is active (ENQed to another job or task on this system or another system).

Action: FDRPAS will copy all tracks allocated to the data set, and it will copy this and all other active data sets on the volume last, in order to avoid possibly re-copying updated tracks many times.

FDR210 I/O ERROR ON TARGET UNIT=*uuuu*

Reason: An I/O error occurred on the target device (documented by a preceding FDR149 message). Is it also issued to the console as a non-scrollable message.

Action: If SWAPIOERR=NORETRY was specified or defaulted, the swap is immediately terminated.

If SWAPIOERR=RETRY was specified, it will have the additional text "**I/O WILL BE RETRIED EVERY 5 SECONDS**" and the failing I/O will be retried until it is successful or until the swap is aborted. If the I/O is eventually successful, the message is issued again with the additional text "**RECOVERED**".

390.03 CONTINUED . . .

FDR233 *systemid* (SERIAL# *sssssssss*) ACKNOWLEDGES THE *function* OF VOL=*vvvvvv* AND HAS JOINED IN THE *function* OF UNIT=*ssss* TO *tttt*

Reason: The FDRPAS monitor task on the indicated system acknowledged the request for volume vvvvvv and has joined in the function from the source volume on device number ssss to the target device on device number tttt. "systemid" is the GRS system name and "sssssssss" is the hardware serial number of that system as reported by the STIDP instruction. The unit addresses shown are the addresses on the system indicated (the same device may have different addresses on different systems). This message will print in the output of the monitor task on each system, and the message from **every** system will print in the output of the swap task for the volume. "function" will be SWAP for a SWAP function or DUMP for a SWAPDUMP function.

***systemid* (SERIAL# *sssssssss*) ACKNOWLEDGES THE *function* OF VOL=*vvvvvv* AND WILL NOT JOIN BECAUSE SOURCE IS NOT ONLINE**

Reason: This form of the FDR233 message indicates that the FDRPAS monitor task on the indicated system acknowledged the swap request for volume vvvvvv but will not participate because that volume is not online on that system. "systemid" is the GRS system name and "sssssssss" is the hardware serial number of that system as reported by the STIDP instruction. The unit addresses shown are the addresses on the system indicated (the same device may have different addresses on different systems). This message will print in the output of the monitor task on each system, and the message from **every** system will print in the output of the swap task for the volume. "function" will be SWAP for a SWAP function or DUMP for a SWAPDUMP function.

CPU WITH (SERIAL# *sssssssss*) IS ATTACHED TO VOL=*vvvvvv* WAS EXCLUDED

Reason: This form of the FDR233 message is issued by a SIMSWAP operation. It indicates that FDRPAS has identified that the system with hardware serial "sssssssss" is attached to the source volume "vvvvvv". “WAS EXCLUDED” will appear only if an EXCLUDE statement was included for that serial.

Action: Verify that a FDRPAS monitor task will be running on each of the identified systems (except for excluded systems), monitoring the target device for this swap, before you run the real SWAP operation. If some of the identified systems will not participate in the swap, you may need to exclude them (see "Multi-system Determination" in Section 320.01 for details).

CPU WITH (SERIAL# *sssssssss*) CANNOT DETERMINE # OF SYSTEMS ATTTACHED TO VOL=*vvvvvv*

Reason: This form of the FDR233 message is issued by a SIMSWAP operation. It indicates that FDRPAS cannot determine the systems attached to the specified volume, because it is in a subsystem that does not support that determination. “sssssssss” is the serial of the system on which SIMSWAP is running.

Action: Use the #SYSTEMS= operand on the SWAP statement when swapping this volume; be sure to specify the number of systems correctly and insure that a monitor task is running on each system.

390.03 CONTINUED . . .

FDR234 *function* ERROR ON VOL=*vvvvvv* - UNIT=*uuuu* REASON=*reason*

Reason: FDRPAS had an error which caused the operation on the specified volume to the specified unit to fail. "function" will be SWAP for a SWAP function or DUMP for a SWAPDUMP function. Reason codes include:

0 - I/O INTERCEPTS ADDRESSES HAVE CHANGED - the FDRPAS I/O intercept addresses in the DDT of the source volume have changed unexpectedly. This probably indicates that some other program has also installed an I/O intercept on the source volume, with unknown results.

1 - MOUNT STATEMENT NOT SPECIFIED - There were no MOUNT statements following a SWAP or MONITOR statement. MOUNT statements are used to define the source volume and target device for SWAP or the potential target volumes be monitored for MONITOR.

2 - MOUNT STATEMENT NOT FOUND - some control statements were provided after the SWAP or MONITOR statement, but none of them were MOUNT statements. Only MOUNT statements can follow that statement.

3 - SWAPUNIT= NOT SPECIFIED IN MOUNT STATEMENT OR MORE THAN 1 UNIT - SWAPUNIT= must be specified on the MOUNT statement. Following a SWAP statement, the SWAPUNIT= operand can only specify a single device.

4 - SOURCE AND TARGET UNIT ADDRESS ARE EQUAL- the current device address of the volume specified by VOL= is equal to the device address specified by SWAPUNIT=.

5 - INCOMPATIBLE SOURCE AND TARGET UNIT DEVICE TYPES - the device type of the source volume specified by VOL= is different from the device type of the target device specified by SWAPUNIT=. For example, one is a 3380 and the other is a 3390.

6 - TARGET SWAPUNIT NOT FOUND - the device address specified by SWAPUNIT= was not found in the current I/O configuration.

7 - TARGET SWAPUNIT NOT DASD - the device address specified by SWAPUNIT= is not configured as a disk (DASD) device.

8 - TARGET SWAPUNIT IS NOT OFFLINE - the device address specified by SWAPUNIT= is not marked offline. If this is the intended target device for the swap, vary it offline on all systems and resubmit the swap request.

9 - TARGET VOLSER CHANGED - the volume serial on the target volume was changed unexpectedly. One possible cause is an ICKDSF offline INIT of the target device during the swap.

A - SWAP TARGET UNIT ALREADY IN USE - the specified target device is already in use as a swap target for another source volume. Another FDRPAS swap task has this device ENQed and is trying to initiate a swap to it.

B - SOURCE VOLUME DOES NOT CONTAIN VOL1 - the source volume is online but does not contain a proper MVS volume label. Use FDRDSF PRINT or another tool to print the label track of the volume and contact Innovation for assistance.

C - CPUXXXXX PAS I/O INTERCEPT FAILED CODE=*c* - an FDRPAS I/O intercept on the source volume had an internal failure and has de-activated itself. The code "c" indicates the cause:

0 - unknown CCWs (see REASON=E) or illogical condition
1 - an IOSB had a 64-bit real address
2 - a CCW chain included a TIC to a TIC, an illegal sequence
4 - the maximum number of concurrent update I/Os which FDRPAS can handle on one device was exceeded. Re-submit this swap at a time when less update activity is ocurring
6 - the DDT of the source volume was unexpectedly changed
7 - an I/O to a PAV alias address on an IBM 2105 was executed

390.03 CONTINUED . . .

D - JES3-MANAGED DISK - this system is executing under JES3 and the disk to be swapped is flagged as JES3-managed (disks referenced by a DEVICE statement in the JES3 initialization parameters are JES3-managed). Even under JES3, MVS-managed disks can be swapped by FDRPAS.

E - *systemid* PAS I/O INTERCEPT FOUND UNKNOWN COMMAND(S) - The FDRPAS I/O intercepts on the source device on the indicated system encountered an I/O sequence that it could not interpret. Since the effects are unknown, FDRPAS could not determine if tracks were updated. The monitor task will print a summary of the unknown commands with the jobname and time of the issuer; please attempt to determine what that job was doing and contact Innovation so that we can determine if FDRPAS can be enhanced to handle the unknown commands.

Note: If the job was using facilities which are documented as restricted during a swap (see Section 320), you may be able to resubmit the swap when those facilities are not in use.

F - *systemid* FAILED THE SWAP REASON=*x* - The FDRPAS monitor task on the indicated system failed the swap. "x" is an additional reason code, which usually matches the FDR234 reason code. Save the listing from the monitor or swap task on the indicated system to determine the cause. Contact Innovation for assistance if necessary.

G - INSUFFICENT STORAGE IN REGION - increase the REGION= parameter specified in the FDRPAS JCL; REGION=0M is recommended. It may also occur if too many FDRPAS tasks are executing in this address space; in that case, reduce the number of concurrent tasks.

H - COULD NOT RAISE IOS LEVEL OR I/O HUNG ON SOURCE - FDRPAS attempted to raise the IOSLEVEL of the source device, to inhibit I/Os for a short time during a phase of the swap, but either the IOSLEVEL request failed or there is an active I/O on the device which has not completed within 2 minutes. During Phase 5, it can also occur if one system held a long-term RESERVE or had a long-running I/O on the source device; you may need to retry the swap during a time when such long I/Os are not likely to occur.

H - COULD NOT RAISE IOS LEVEL VOLUME RESERVED - FDRPAS attempted to raise the IOSLEVEL of the source device, to inhibit I/Os for a short time during a phase of the swap, but some other task held a long term RESERVE on the device. Either a task holding the RESERVE is hung or a process holding a long-term RESERVE, such as a restore of the device, is in progress.

I - I/O INTERCEPTS FAILED TO ACTIVATE - the dynamic installation of the FDRPAS I/O intercepts on the source device was unsuccessful.

J - MONITOR SWAP FOUND MULTIPLE MOUNT STATEMENTS - a MONITOR statement may be followed by only one MOUNT statement, although that MOUNT may specify multiple devices or device groups to monitor. See Section 310.06.

K - MONITOR SWAP FOUND NO MATCHING OFFLINE UNITS - none of the device addresses specified on the MOUNT statement following a MONITOR statement were offline disk devices.

L - OUR SERIAL# NOT IN ESTABLISHED PATHS - DEFAULTING TO #SYSTEMS= - the source volume is on a control unit which reports the systems with access to the disk, but the ID of the system that the FDRPAS swap task is executing on is not among those systems. This may indicate a failure in that hardware facility. If you specified the #SYSTEMS= operand, we will default to that value. If necessary, contact Innovation for assistance.

M - CPU (SERIAL#=*serial*) FAILED TO RESPOND IN PHASE x - the system with the indicated CPU serial number did not respond during the indicated phase of FDRPAS operation. This will usually result in message FDRW68; see that message for possible causes.

390.03 CONTINUED . . .

N - MORE THAN 128 ACTIVE SYSTEMS OR INTERNAL ERROR - either more than 128 systems have access to the source volume or an error occurred determining the number of systems.
N - MONITOR EXCEEDED MAXIMUM NUMBER OF UCBS FOR 1 JOB - the MOUNT statement following a MONITOR statement specified more than 8190 offline disk device addresses.
O - CONSISTENCY GROUP MISMATCH SOURCE=grpname TARGET=grpname - FDRPAS detected that the source volume was in a EMC consistency group and either the target volume was not in a consistency group, or was in a different group. "grpname" may be N/A if FDRPAS was unable to determine the name or if the target is not in a group.
P - ACTIVE PAGE/SWAP DATA SET ON VOLUME - the volume to be swapped contained an active local page or swap dataset.
Q - SWAP OPERATION CANCELLED BY OPERATOR - the console operator replied NO to the FDRW02 message requesting confirmation of the swap. To avoid this message and proceed with the swap without operator confirmation, specify CONFMESS=NO on the SWAP statement.
R - DISK DOES NOT SUPPORT ACTIVE CPU SERIAL# - SPECIFY #SYSTEMS= - the source device is in a disk subsystem which does not support identifying the serial numbers of the systems which have access to the device (such as a 3990-3, IBM RVA or StorageTek SVA/V960). You must specify #SYSTEMS=nnn on the SWAP statement to identify the number of systems with access to the disk.
S - SWAPUNIT DOES NOT SPECIFY 4 CHARACTERS - the MOUNT statement following a SWAP or SWAPDUMP statement must specify a 4-digit target device address.
T - VOL= ON MOUNT MISSING OR NOT FULL VOLSER - the MOUNT statement following a SWAP or SWAPDUMP statement must specify source volume serial, with no asterisk.
U - COMMAND SPECIFIED THAT IS NOT A MOUNT - only a MOUNT statement is supported following a SWAP, SWAPDUMP or MONITOR statement.
V - SWAP TARGET VOLUME DOES NOT SUPPORT LOCATE - the specified target device does not support the LOCATE RECORD CCW so it is not supported by FDRPAS. This usually means that the device is in a non-caching IBM 3880 subsystem.
W - SWAP SOURCE VOLUME CURRENTLY BEING SWAPPED - the specified source volume is already being processed by FDRPAS.
X - SWAPUNIT ALREADY IN SWAP STATUS OR PRIOR FAILURE - the selected target device is already involved in a swap or a prior swap failed in a way that FDRPAS did not completely cleanup the swap. If you are sure that target device is not currently involved in another swap, re-initialize the target disk with an offline ICKDSF INIT and re-execute the swap.
Y - SWAPUNIT MISMATCHED NUMBER OF CYLINDERS - the source volume and target device do not have the same number of data cylinders. To accept the swap to a target device with more cylinders, specify LARGERSIZE=OK on the SWAP statement.
Z - SWAPUNIT DOES NOT HAVE A VALID DCE OR VOLUME RESERVED - FDRPAS cannot locate the DCE (Device Class Extension of the UCB) for the target device or the target device has a non-zero RESERVE count. This should not occur; contact Innovation for assistance.

Action: The swap is terminated. Depending on the error, you may be able to correct the error and re-execute the swap. If in doubt, contact Innovation for assistance.

390.03 CONTINUED . . .

FDR235 FDRPAS ON CPU SERIAL# sssssssss IS MONITORING THE FOLLOWING *nnnnnn* UNITS: *list of device numbers*

Reason: An FDRPAS monitor task is monitoring the potential offline target devices listed. It is executing on a system with serial number "sssssssss". If some target devices you specified are not listed, it means that those devices were online on this system (monitor tasks will bypass online disks).

FDR236 *systemid* ACTIVATED I/O INTERCEPTS ON UNIT=*uuuu*

Reason: the system indicated has joined in the swap of an online volume on device number uuuu by installing the FDRPAS I/O intercepts on the device. This message is printed by the monitor task on that system. It is also printed for all systems by the swap task for the volume.

***systemid* DE-ACTIVATED I/O INTERCEPTS ON UNIT=*uuuu nnnnnnnn* TRACKS UPDATED**

Reason: This form of the FDR236 message shows that the system has de-activated the I/O intercepts on device number uuuu. While the intercepts were active, a total of nnnnnnnn tracks were updated on the volume by this system (this total counts tracks multiple times if they were updated during more than one pass). This message is printed only by the monitor task on that system.

FDR237 *systemid* FAILED TO DE-ACTIVATE I/O INTERCEPTS ON UNIT=*uuuu*

Reason: the system indicated attempted to de-activate the I/O intercepts on device number uuuu but the attempt failed for some reason. Other messages will indicate if the swap was successfully completed or not.

Action: The intercepts remain active. In some cases this will cause no harm, but they will remain active until the next IPL. However, if the deactivation failed because some other software was trying to modify the DDT of the disk to install its own intercept, failures may occur. In either case, contact Innovation for assistance.

FDR238 FDRPAS *startend* MONITOR JOIN TASK FOR UNIT=*uuuu* STC=procname.taskname

Reason: If a FDRPAS monitor task is monitoring more than one potential target device, it must start a separate FDRPAS monitor task when it detects a swap is beginning on one of those devices. This message documents that such a "join" task has started or ended for device number uuuu. "startend" will be STARTED or ENDED. Note that a join task may not print either message if it was started for a potential swap but determined that a swap was not actually occurring on the target device. If the monitor task was started as an external started task, "STC=" will appear, documenting the name of the FDRPAS proc (usually PASPROC) and the name of the started task; if the monitor task was started as an internal subtask, this will not appear. If a monitor task ended with an error condition, the additional text "WITH ERRORS" will appear.

390.03 CONTINUED . . .

FDR239 *nnnnnnn* TRACKS UPDATED BY *systemid*
nnnnnnn TOTAL UNIQUE TRACKS UPDATED IN PASS *ppppp* -
RE-COPYING UPDATED TRACKS

Reason: Once FDRPAS has completed the initial copy phase during a swap of a volume, it will re-copy any tracks which were updated on that volume during that phase. If additional tracks are updated during that re-copy pass, those tracks may be copied again during an additional pass.

The first form of the message shows the number of updated tracks that were reported by the monitor or swap task on the indicated system during one pass. One message is printed per system participating in the swap if the number reported by that system is non-zero.

The second form of the message shows the total tracks that were updated and must be re-copied during the pass; this may be less than the total of the tracks reported by each system if the same tracks were updated by more than one system.

Action: These messages will repeat, and the pass number will increment, until the total number of tracks to be re-copied falls below a threshold, at which point FDRPAS will complete the swap.

- CONFIRMSWAP IN EFFECT

Reason: If this additional text is displayed, CONFIRMSWAP=YES is in effect for the volume.

Action: When the number of tracks to be re-copied falls below the threshold, these messages will repeat, and the pass number will increment, until you indicate that FDRPAS is to complete the swap via the FDRPAS ISPF interface (see Section 310.31) or a TYPE=CONFIRMSWAP batch job (see Section 310.07).

- CFW/CC DELAY IN EFFECT

Reason: If this additional text is displayed, FDRPAS detected that some job is using Cache Fast Write (CFW) or Concurrent Copy (CC) on the volume.

Action: If the volume is swapped while CFW or CC is in use, the CFW/CC job may fail, so FDRPAS will delay the swap up to 2 minutes to see if the CFW/CC user will finish. Note that if no CFW or CC I/O is issued for a few minutes, FDRPAS may think it is done, or may never detect the CFW/CC usage at all, so it is still possible for the job to fail after the swap is complete.

FDR240 SWAP FOR VOL=*vvvvvv* WAS ABNORMALLY TERMINATED BY *systemid*
SWAP FOR VOL=*vvvvvv* WAS CANCELLED BY OPERATOR ON *systemid*

Reason: The swap of volume vvvvvv was terminated by an action, either an abnormal termination of FDRPAS or a request to terminate, on the indicated system. CANCELLED will appear only if the swap was terminated via the FDRPAS ISPF interface. Check the listing of the monitor task from that system for the reason.

FDR241 FDRPAS SUCCESSFULLY COMPLETED SWAP OF VOL=*vvvvvv* TO UNIT=*uuuu* ON *systemid*

Reason: FDRPAS has completed the swap of volume vvvvvv to unit uuuu on the indicated system. This message will print in the monitor task output on each system, and the message from each system will also print in the swap task output.

390.03 CONTINUED . . .

FDR242 ADDRESS SPACE CREATE TO JOIN FAILED FOR UNIT=*uuuu* COMP=*cccc*

Reason: If a FDRPAS monitor task is monitoring more than one potential target device, it must start a separate FDRPAS monitor task when it detects a swap is beginning on one of those devices. However, the address space creation for a "join" task for unit uuuu failed with return code cccc. If COMP=cccc is not displayed, one possible reason is that you have not placed the PASPROC JCL member required in an appropriate system procedure library, or you have renamed it and not updated the name in the FDR global option table (see Section 380.06). A return code of 52 indicates that the system was unable to create an address space for the join task, because of system resource limitations or the system-wide limit on address spaces is exceeded.

Action: Check SYSLOG for messages to determine the cause. If possible, correct the error and re-submit the FDRPAS request.

FDR243 SWAP OF UCB ADDRESSES FAILED VOL=*vvvvvv* COMP=*ccccc*

Reason: FDRPAS has invoked a system service to swap the UCBs (Unit Control Blocks) of the indicated source volume and its target device, but that service failed with return code "ccccc". This message is printed only in the output of the monitor task on the affected system, but the swap task will print a related message indicating the failure on this system.

Action: Check the output of the swap and monitor tasks on all systems. If the swap failed on all systems, then the swap was terminated and no harm was done. **If the swap completed on one or more systems, then you should stop all usage of the volume on the failing systems, since updates are now being directed to the wrong device, and contact Innovation *immediately* for assistance.**

FDR244 *systemid* FAILED TO ACKNOWLEDGE SWAP COMPLETION VOL=*vvvvvv*

Reason: FDRPAS attempted to complete the swap operation, but the system indicated did not acknowledge that the swap was complete. That system may have become non-operational during the swap, or the FDRPAS monitor task on that system may have failed or been cancelled. The swap may have completed on some systems. This message is printed in the output of the swap task.

Action: Check the messages from the FDRPAS monitor task on the indicated system(s). If it indicates that the swap was completed on all systems, then the swap was successful and no action must be taken. **If the swap did not complete or the monitor task was terminated prematurely on one or more systems, then you should stop all usage of the volume on the failing systems, since updates are now being directed to the wrong device, and contact Innovation *immediately* for assistance.**

FDR245 FDRPAS CONFIRMED THE SWAP OF VOL=*vvvvvv*

Reason: A MONITOR TYPE=CONFIRMSWAP or CONFIRMSPLIT was submitted for one or more volumes. When all the specified volumes are ready for completion, FDRPAS will complete the SWAP or SWAPDUMP and issue the FDR245 message for each volume.

390.03 CONTINUED . . .

FDR246 SWAP NOT ACTIVE FOR CONFIRM OF VOL=*vvvvvv*

Reason: A MONITOR TYPE=CONFIRMSWAP or CONFIRMSPLIT was submitted for one or more volumes, but the volume indicated was not currently involved in a SWAP or SWAPDUMP operation with CONFIRMSWAP=YES or CONFIRMSPLIT=YES specified.

Action: Correct the list of volumes specified on MOUNT statements to include only those actively being swapped and re-submit the job.

FDR247 UNABLE TO CATALOG SWAP HISTORY RECORD COMP=X' ffff00001111'

Reason: After a swap, FDRPAS attempted to catalog a history record to document the swap, but the catalog request failed. COMP contains the catalog return codes from registers R15 (ffff), R0 (0000), and R1 (1111). The swap was successful but it was not recorded for historical and reporting purposes.

Action: The history record will be cataloged into the system catalog with an alias equal to the value of PASINDEX (see Section 380.05). The catalog may be full; if so, uncatalog some old history records. If you cannot find any problem with the catalog, contact Innovation for assistance.

UNABLE TO CATALOG SWAP HISTORY RECORD - NO ALIAS FOR PASINDEX

Reason: This form of the FDR247 message indicates that after a swap, FDRPAS attempted to catalog a history record to document the swap, but there was no alias defined in the master catalog of this system matching PASINDEX (see Section 380.05). The swap was successful but it was not recorded for historical and reporting purposes.

Action: If you wish history records to be recorded on this system, define a user catalog (if necessary) and associated an alias matching PASINDEX with that catalog.

UNABLE TO CATALOG SWAP HISTORY RECORD - CATALOG ON VOLUME BEING SWAPPED

Reason: This form of the FDR247 message indicates that after a swap, FDRPAS attempted to catalog a history record to document the swap, but the catalog pointed to by the alias matching PASINDEX (see Section 380.05) was on the volume being swapped, so FDRPAS is unable to record this swap. The swap was successful but it was not recorded for historical and reporting purposes.

FDR248 NO OFFLINE UNITS LEFT TO MONITOR

Reason: A FDRPAS monitor task discovered that all of the offline units it was monitoring are now online or are otherwise ineligible for monitoring. This may occur if FDRPAS swap tasks have swapped volumes to all of those offline units.

Action: The monitor task terminates normally.

390.03 CONTINUED . . .

FDR249 WARNING: type VOLUME SWAPPED TO NON-*type* VOL=*volser*

Reason: You requested that volume "volser" be swapped, but FDRPAS detected that the volume was currently being mirrored by a hardware facility such as PPRC.

Action: This message warns you that after the swap is complete, the volume may no longer be protected by a remote mirror. If your disaster recovery plan or other needs require that this volume be remotely mirrored, you will need to re-establish remote mirroring after the swap is complete.

FDR250 CYL=*ccccc xxxx xxxx ... xxxx*

Reason: Internal message showing each cylinder and track updated on this system during a Phase 3 pass; it appears only if PRINT=ALL is specified on the SWAP or MONITOR statement. "ccccc" is a cylinder number in decimal. "xxxx" displays a set of 16 bits in hex; the first 15 bits show which tracks were updated. The first "xxxx" is for cylinder "ccccc", the next for cylinder "ccccc"+1, etc., up to "ccccc"+19, thus showing 20 cylinders in each FDR250 message.

FDR251 FDR UNBOUND PAV ALIASES FROM UNIT=*uuuu*

Reason: Unit "uuuu", which is the source or target device of a swap, had Parallel Access Volume (PAV) aliases bound to it. FDRPAS has unbound the aliases and disabled PAV on the device during the swap.

FDR251 FDR RE-ENABLED PAV FOR UNIT=*uuuu*

Reason: Unit "uuuu", which is the source or target device of a swap, has Parallel Access Volume (PAV) re-enabled. If it had static PAV aliases assigned, they have been rebound to the base device. This will be done only if both the source and target devices in a swap were enabled for PAV before the swap.

FDR252 FDR SWAPPED IPLABLE UNIT=*uuu1 TO uuu2*
YOU MUST UPDATE YOUR HARDWARE MANAGEMENT CONSOLE

Reason: Unit "uuu1", which is the source device of a swap, is an IPLable volume, meaning that it had IPL text or an IODF data set on it. This may mean it was the system residence (SYSRES) volume for a OS/390 or z/OS system, or it may mean it contained an IPLable utility such as ICKDSF, SAR, DFSMSdss, or SADMP. It has been swapped to unit "uuu2". This message is issued as a non-scrollable console message as well as printed in the FDRPAS output.

Action: If it was a SYSRES, you must update the IPL or IODF address in the system startup parameters on the HMC or hardware console for that system. If it contained an IPLable utility, you should update appropriate documentation with the new IPL address.

390.03 CONTINUED . . .

FDR253 REASON=*reason*

Reason: An error occurred when FDRPAS was trying to activate or de-activate its I/O intercepts on a source volume. This message is issued only as a WTO to the operator but it will also appear in the joblog of the FDRPAS job. Reason codes include:

1 - PASV ID ERROR - internal installation error. Contact Innovation.

2 - PAS DDT FIND ERROR - internal installation error. Contact Innovation.

3 - GETMAIN ERROR - an error occurred doing a GETMAIN for storage in ECSA for the intercepts.

4 - NO DCE ERROR - the source volume UCB does not point to a DCE (Device Class Extension). This should not be possible for an online disk.

5 - DCE LENGTH ERROR - the DCE (Device Class Extension) pointed to by the UCB of the source volume is not at least 48 bytes in length. This should not be possible.

6 - DCEALCYL INVALID ERROR - number of alternate cylinders in the DCE (Device Class Extension) of the source volume is not valid. This may indicate that the source device is on an old control unit not supported by FDRPAS.

7 - XTID VALIDATION ERROR - internal validation/coordination error. Contact Innovation.

8 - NAME/TOKEN NOT FOUND - internal validation/coordination error. Contact Innovation.

9 - NAME/TOKEN CREATE ERROR - internal validation/coordination error. Contact Innovation.

A - NAME/TOKEN DELETE ERROR - internal validation/coordination error. Contact Innovation.

B - TOKEN ERROR=0 - internal validation/coordination error. Contact Innovation.

C - NAME/TOKEN RETRVE ERROR - internal validation/coordination error. Contact Innovation.

D - LOAD ERROR - an error occurred loading the intercept module FDRPASXT.

E - BLDL ERROR - an error occurred during a BLDL on the intercept module FDRPASXT.

F - UCBDDT CHANGED ERROR - The pointer to the DDT (Device Descriptor Table) in the UCB of the source volume changed unexpectedly.

G - UCB BUSY OR IOSLEVEL NOT RAISED - either the IOSLEVEL function failed to raise the IOS level of the source volume, or the source volume was continuously busy for 2 seconds.

H - ABNORMAL EXIT ADDR NOT RESET - internal installation error. Contact Innovation.

I - DDT NOT WITHIN IGGDDT* - internal installation error. Contact Innovation.

J - UNABLE TO FIND MATCHING MIHB - for either the source volume or target device, FDRPAS was unable to find an entry in the MIHB (MIH table) with a key value matching the UCBMIHKY value in the associated UCB. Since this would cause a failure when the volume is swapped, the swap will not be attempted. You may be able to use the console command "SET IOS=xx" to rebuild the MIHB and retry the swap.

Action: The swap is terminated. Contact Innovation for assistance.

390.03 CONTINUED . . .

FDR254 INDEXED VTOC BUILD COMPLETE

Reason: A SWAPBUILDIX function completed successfully. This form of the FDR254 message is issued by the SWAPBUILDIX task.

INDEXED VTOC REFRESHED

Reason: A SWAPBUILDIX function completed successfully. This form of the FDR254 message is issued by the monitor tasks participarting in the function to indicate that the indexed VTOC information has been updated on this system.

INDEXED VTOC BUILD FAILED - CHECK IXSYSPRT

Reason: A SWAPBUILDIX function failed.

Action: A IXSYSPRT DD statement was dynamically allocated to SYSOUT; check it for messages from ICKDSF.

FDR255 SWAP TERMINATED TARGET UNIT *uuuu* CONTAINS DATA SETS FIRST DSN=*dsname*

Reason: CHECKTARGET=YES was specified, and the offline target disk designated for a SWAP or SWAPDUMP was not empty. It contained at least one data set other than the VTOC, VTOCIX and VVDS. The first data set name encountered in the VTOC is listed.

Action: Check the target disk to see if it contains data which must be preserved; you may need to vary the disk online in order to list its VTOC. If so, choose another target for the swap. If not, remove the CHECKTARGET=YES operand (or specify CHECKTARGET=NO) to overlay the target disk.

FDR256 REPORT FROM SYSPRINx

Reason: MAXTASKS= was specified. Messages from swap subtasks are written to SYSPRINx DD statements, but they are also echoed in SYSPRINT with this header when each swap terminates.

FDR257 DYNAMIC PACE DELAY CHANGED TO *sss.ss* SEC - I/O DELAY *mmmmm* MSEC

Reason: PACING=DYNAMIC was specified. Every 15 seconds FDRPAS may issue this message to indicate that the I/O pacing value was changed to "sss.ss" seconds because the average I/O delay, as determined by an internal FDRPAS algorithm, has changed to "mmmmm" milli-seconds.

FDR258 *e-mail error text*

Reason: The FDREMAIL DD statement was provided to invoke the FDR e-mail facility, but an error occurred which prevent an e-mail from being sent. The message will be printed on SYSPRINT and will also be sent via a WTL (Write-To-Log) macro, so it will appear in the joblog of the FDRPAS job, and may appear on a system console. The message text will define the error condition. It may contain TCP/IP error codes which can be found in IBM Communication Server manuals.

Action: FDRPAS will continue if it has more volumes to process. Correct the error for future jobs.

390.03 CONTINUED . . .

FDR259 EMAIL MESSAGE(S) SENT

Reason: The FDREMAIL DD statement was provided to invoke the FDR e-mail facility, and one or more e-mail messages were successfully sent to the mail server you specified. Note that this is no guarantee that the messages will be delivered if e-mail addresses are invalid or other errors occur after the mail server accepts the message.

FDR260 VARY ONLINE FAILED CODE=codes

Reason: FDRPAS called the IBM service IEEVARYD to initialize system control blocks for the target device, and the VARY failed with the codes and/or message shown.

Action: Despite the error, the target device will be online and usable. Contact Innovation for assistance in determining if there are any considerations due to the error.

390.03 CONTINUED . . .

FDR302 CONTROL STATEMENT ERROR NEAR REL LOCATION *nn* – REASON *x* – JOB TERMINATED

Reason: An error was encountered during the processing of a user-supplied control statement. If "NEAR REL LOCATION nn" appears, the keyword or operand causing the error is at or near column "nn" on the input statement.
The error is defined by the reason code within the message. The failing statement is displayed immediately above.

Note: The expression "SELECT statement" in the reason codes below refers to SELECT and EXCLUDE statements. For FDRABR, it also refers to MOUNT, PROFILE and PROTECT statements.

The reason "x" can be:

1 A MOUNT statement did not specify any operands. Control statement was blank after the Command name.
2 Command name on the first control statement was incorrectly specified. It must be SWAP, SWAPDUMP or MONITOR.
3 Operand on the first control statement was incorrectly specified.
4 Operand did not end with a blank or comma.
5 SYSIN data set was empty.
6 Expected continuation statement was not found. The previous statement ended with a comma and a blank.
7 a. On the first control statement, invalid or incompatible operands were specified.
b. The TYPE= operand was omitted on SWAP, SWAPDUMP or MONITOR statement.
8 An operand on a MOUNT statement specified a blank or comma after the equal sign.
9 On the control statement printed above, one of the options exceeded its maximum length. On a MOUNT statement for MONITOR, more than 255 addresses or address masks were specified.
C Maximum number of MOUNT statements was exceeded. The limit is 250 or the value specified for MAXCARDS=.
F An operand that requires numeric data (e.g., MAXCARDS=) specified non-numeric characters, or an operand that requires hexadecimal data (e.g., SWAPUNIT=) specified non-hex characters.
G An operand did not end with a blank or comma or exceeded 15 digits (e.g., MAXCARDS=).
I Keyword is invalid under the operation indicated.
J Control statement was completely blank. You can enter comment lines by placing an * (asterisk) in column 1.
K A required operand was not specified on the preceding statement.
Q Keyword exceeded maximum value or was negative.
R TYPE=xxx was specified multiple times.
S An operand on the MOUNT statement was specified multiple times or was mutually exclusive with another operand.
U The TYPE=xxx operand was missing or invalid on the first statement. This operand is required.

Action: Correct error and resubmit job. If you don't understand the error after reviewing the relevant sections of this manual, call Innovation for assistance.

Hint: if the control statements look good and you can't see any obvious reason for the error, check the JCL to be sure you are executing the right program for the statements you provided (PGM=FDRPAS).

390.03 CONTINUED . . .

FDR303 CARD IMAGE - *control statement image source*

Reason: An input control statement is displayed by this message. "source" may be:
blank - from SYSIN
PARM ENTRY - from the JCL PARM= operand.

FDR313 *fff* TERMINATED BY OPEN EXIT ON VOL=*vvvvvv*

Reason: The locally-written FDR volume open exit has terminated processing of the volume "vvvvvv".

FDR319 FDR OPERATION ABNORMALLY TERMINATED VOL=*vvvvvv*
COMP CODE=S*ssss* U*uuuu*

Reason: An internal FDR subtask failed on volume "vvvvvv".

If "sss" is non-zero (in hex), the task failed with a System Ssss ABEND. Consult IBM documentation for the meaning of the ABEND. Sx13/Sx14 ABENDs are OPEN/CLOSE errors and are accompanied by an explanatory message in the joblog of the FDR job.

If "uuuu" is non-zero (in decimal), the task failed with a User Uuuuu ABEND. The ABEND is probably generated by FDRPAS.

Action: If the problem cannot be determined from the ABEND code, call Innovation for technical assistance. If the ABEND produced a storage dump, have it available.

FDR336 DYNAMIC ALLOCATION ERROR COMP=*cc*, CODE=*nnnn*, INFO=*iiii*, DDNAME=*ddname*

Reason: FDRPAS attempted to dynamically allocate (DYNALLOC) a disk volume but the allocation failed. "cc" is the return code in R15, "nnnn" is the dynamic allocation reason code and "iiii" is the dynamic allocation information code. For OS/390, these codes are documented in the IBM manual *Authorized Assembler Services Guide*. They can also be found in Appendix A of the ISPF online HELP.

Action: This volume will be bypassed.

FDR990 INSTALLED Innovation TRIAL WILL EXPIRE ON *yyyy.ddd*

Reason: The expiration date of a trial version of FDRPAS has been extended successfully. It will now expire on date "yyyy.ddd".

Required JCL:

```
//EXTEND     EXEC  PGM=FDREXTND,PARM=xxxx
//STEPLIB     DD   DISP=SHR,DSN=fdrpas.loadlib
//SYSLIB      DD   DISP=SHR,DSN=fdrpas.loadlib
//@BINDNOT    DD   DUMMY
//SYSDIAG     DD   SYSOUT=*
```

The PARM= will be supplied by Innovation.

390.03 CONTINUED . . .

FDR997 FDR ABNORMALLY TERMINATED VOL=*vvvvvv*

Reason: This FDR subtask has encountered an error from which it cannot continue. A user ABEND is being issued.

Action: A message detailing the error is printed.

FDR998 FDRPAS COMPLETED WITH ERRORS VOL=*vvvvvv*

Reason: FDRPAS completed but there were diagnostic messages.

Action: Previous message(s) describe the error; see those messages for further details.

FDR999 FDRPAS SUCCESSFULLY COMPLETED

Reason: FDRPAS ran to completion without errors.

390.04 ABEND CODES

Any of the programs and utilities in the FDR family may ABEND (abnormally end) with any of the following user ABEND codes. In many cases, a diagnostic message is printed before the ABEND, so look up any error messages that were printed first. If no message was printed that relates to this ABEND, then read the explanation below. Call Innovation if you need assistance understanding or resolving the error.

U0100 Open Error Trying to Open a DASD DCB

Usually preceded by a FDR324 message. Check the job log for IBM messages which may indicate the reason for the error.

U0101 Maximum I/O Errors Exceeded on a Direct-Access Device

More disk I/O errors than are allowed by the MAXERR= operand occurred. If you want to complete the operation in spite of the errors, specify a larger MAXERR= value. However, many data sets may be invalid.

U0105 FDRPAS I/O Intercepts failed to install

A timeout occurred while trying to install the FDRPAS I/O intercepts on a source volume.

U0107 IEEVARYD did not complete

FDRPAS invoked the IBM service IEEVARYD for the target device after a swap, but it did not complete. Contact Innovation for assistance.

U0300 Maximum for Count Field Errors on Direct-Access Device Exceeded

More FDR123 messages than are allowed by the MAXERR= operand occurred. If you want to complete the operation in spite of the errors, specify a larger MAXERR= value. However, many data sets may be invalid.

U0301 Maximum for Invalid Record Zeros on a Direct-Access Device Exceeded

U0401 SYSIN DD Statement Error

SYSIN DD statement missing or incorrectly specified or I/O error on SYSIN data set.

U0402 SYSPRINT/SYSPRINn/ABRMAP/SYSMAP DD Statement Error

One of the above DD statements is missing or incorrectly coded or I/O error occurred processing the data set. There must always be a SYSPRINT DD statement, and there must be a SYSPRINn DD statement for each backup TAPEn DD statement when using ATTACH or ABR.

U0502 One or more Control Statements are in Error

U0600 Required DD Statement is Missing or in Error

A message is always printed with the DDNAME and reason.

U0609 Dynamic Allocation Error

Message FDR336 shows the specific cause.

U0612 EXIT Error

A parameter passed back by a user-written security exit was invalid.

U0650 DISKxxxx DD Statement OPEN Failed

U0802 Invalid Completion Code from a User Exit

A parameter passed back by a user security exit was invalid.

U0888 A Non-Terminating Error Occurred

One or more FDRPAS operations abnormally terminated or ended with diagnostic messages, but the errors were not severe enough to prematurely terminate the entire step. This ABEND is issued to call attention to the errors. Examine the printout for the error messages causing this ABEND.

U0901 Error executing the FDR trial extension program, FDREXTND.

U0902 Error executing the FDR trial extension program, FDREXTND.

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READER'S COMMENT FORM

FDRPAS USERS MANUAL V5.4

INNOVATION DATA PROCESSING

If you have comments on this manual, including:

- errors in the text or typographical errors
- clarity
- suggestions for improvement in the manual
- suggestions for improvement in the product
- any other comments

Please complete this form and fax it to Innovation at 973-890-7147 (in Europe you may fax it to your local Innovation office as shown on the front page of the manual).

You may also e-mail your comments to Innovation at support@fdrinnovation.com (be sure to identify the manual name in the message).

Your name: _____

Company name: _____

Mailing address: _____

_____

E-mail address: _____

Comments:_____

_____

_____

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HARDWARE/SOFTWARE PROFILE

Before you begin testing or using FDRPAS, Innovation would appreciate it if you would complete the profile of your hardware and software on this page and fax it to us at 973-890-7147. This will save time for you and us when we provide guidance, assistance, and problem resolution.

COMPANY NAME: _____
TECHNICAL CONTACT NAME: _____
PHONE NUMBER: _____ - _____ - _____

1. Please list your processors and models, e.g., IBM 9672-R66

2. How many MVS (OS/390, z/OS or ESA) system images (systems or LPARs) do you run: _____

3. Please list the versions of operating system in use:

z/OS _____ OS/390 _____ ESA _____

4. Do you use (circle): JES2 JES3 (JES3 users, please contact Innovation before using FDRPAS)

5. Please indicate the type and manufacturer of the DASD subsystems in use in your installation:

Total Terabytes (TB) of DASD data _____ Total number of DASD volumes _____

IBM 3990 (including IBM RAMAC I, II, and III): Y N
attached disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): PPRC DUALCOPY CONCURRENTCOPY

IBM 2105 ESS (Shark): Y N
emulated disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): PAV PPRC FlashCopy ConcurrentCopy

IBM RVA (Ramac Virtual Array): Y N
emulated disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): SNAPSHOT PPRC HSDM

StorageTek SVA/V960 (Shared Virtual Array): Y N
emulated disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): SNAPSHOT PPRC HSDM

EMC Symmetrix 5xxx: Y N and/or **8xxx**: Y N
emulated disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): PAV SRDF TimeFinder ConsistencyGroup ConcurrentCopy

Hitachi Freedom 7700: Y N and/or **9900**: Y N
emulated disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): PAV HRC ShadowImage NanoCopy ConcurrentCopy

Amdahl Platinum/400: Y N and/or **Spectris**: Y N
emulated disks (circle all that apply): 3380 3390-1/2 3390-3 3390-9
features in use (circle all that apply): APRC ConcurrentCopy

Other disk subsystems:_____
_____
_____
_____

6. Do you use IBM's XRC (Extended Remote Copy)? Y N

7. Have you used Amdahl's TDMF software? (circle one): Never Have used TDMF Currently using TDMF

8. Comments/Questions:_____
_____
_____
_____
_____

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